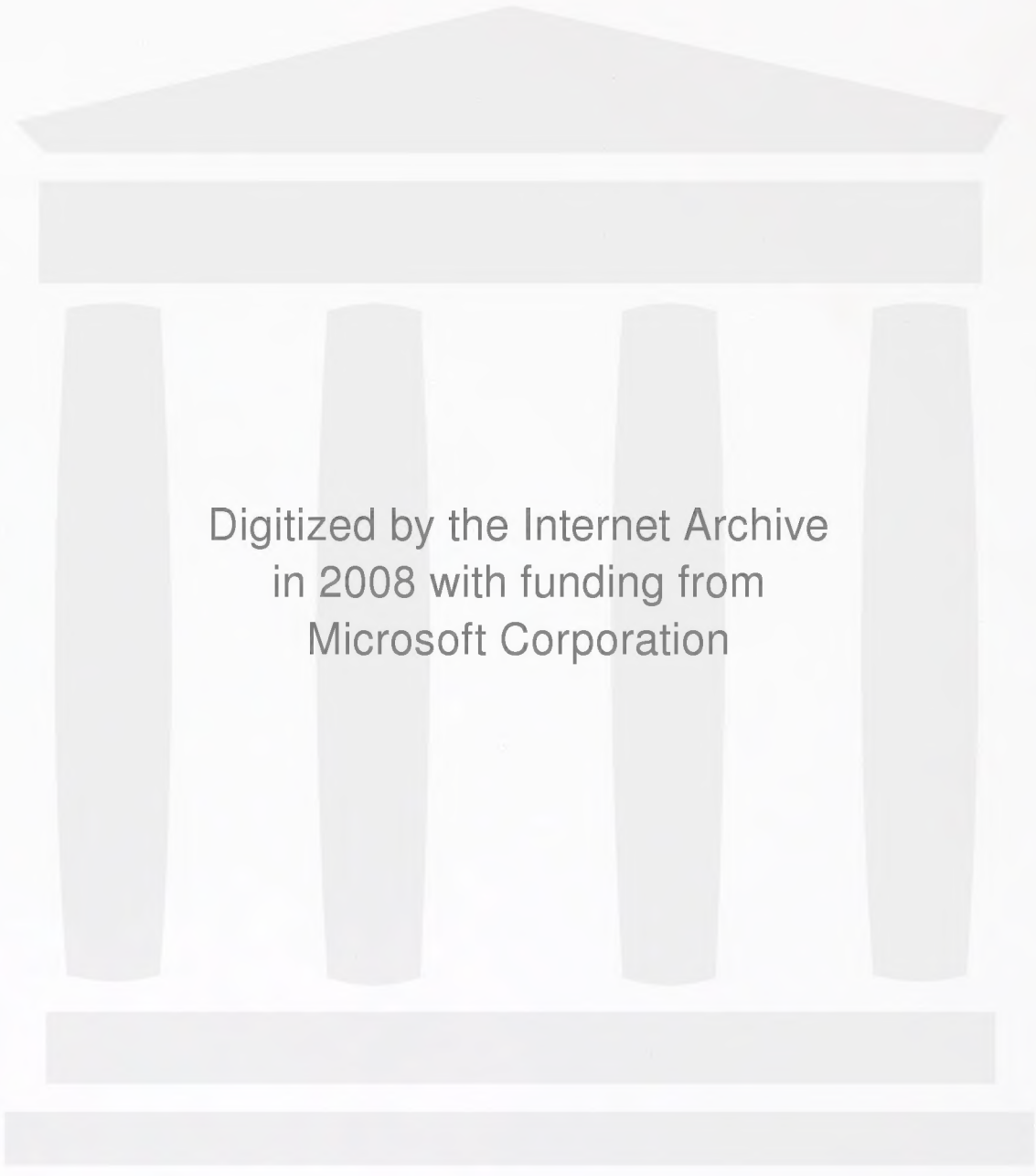

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada.

Vol. XXI. No. 20. Publication Office: Toronto, May 15, 1919 Subscription Price $3.00 per Year

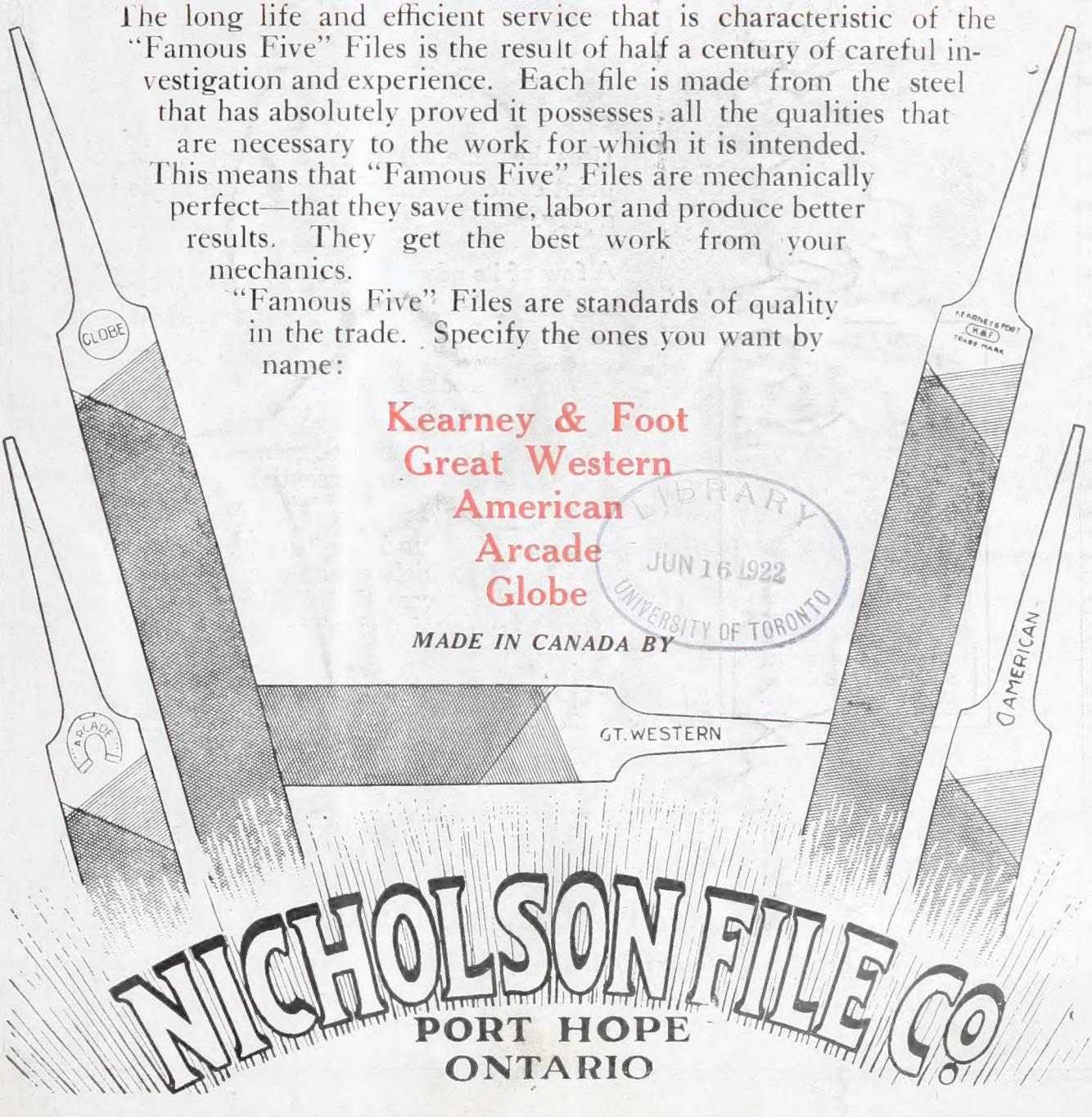
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The long life and efficient service that is characteristic of the "Famous Five" Files is the result of half a century of careful investigation and experience. Each file is made from the steel that has absolutely proved it possesses all the qualities that are necessary to the work for which it is intended. This means that "Famous Five" Files are mechanically perfect—that they save time, labor and produce better results. They get the best work from your mechanics.

"Famous Five" Files are standards of quality in the trade. Specify the ones you want by name:

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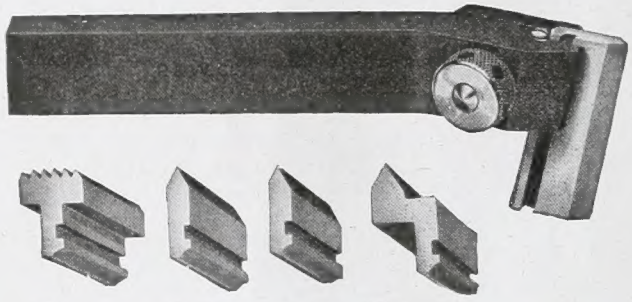


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SMALL TOOLS

P. & W. Threading Tools



Chaser | Single Point | Offset | Double Onset

PROMPT SERVICE

is assured at our nearest office. Place your order there to-day.

Uses the same holder for chasers and single point cutters. The change can be made in a jiffy.

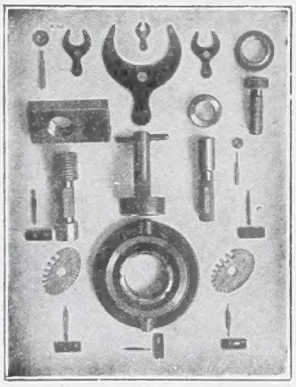
A few of its advantages:

Threads can be cut very close to shoulder.

Tools are sharpened by simply grinding off top of cutter.

Combines economy with all features essential in a threading and forming tool.

Cutters have 15 deg. clearance, which experience has taught gives the longest wear in various metals.



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Standards and Gauges
Accuracy Unequalled

Precision Machine Tools

PRATT & WHITNEY CO.
OF CANADA, LIMITED

Works: DUNDAS, ONTARIO

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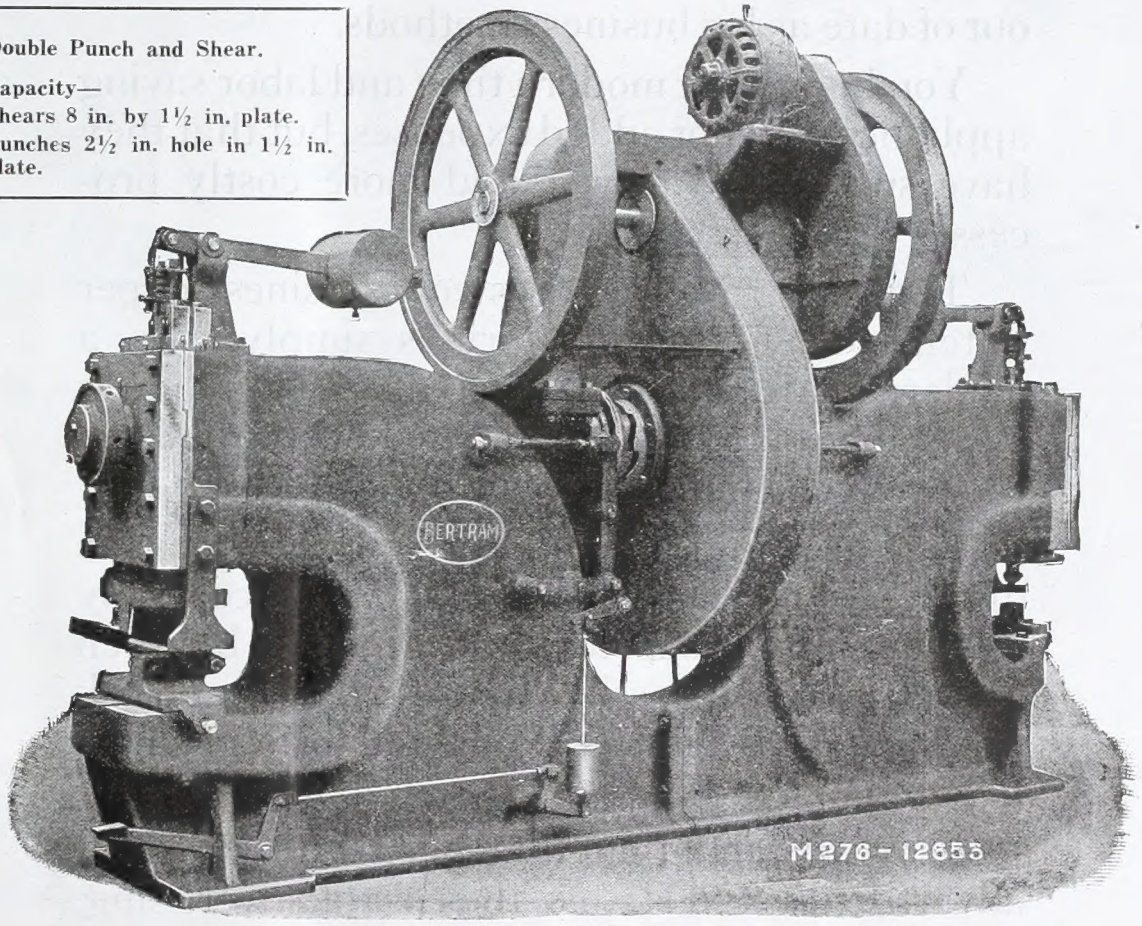
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Modern in design and built for heavy service, our line embraces a varied equipment of Punches, Shears, Bending and Straightening Rolls, Coping Machines, Rotary and Plate Planers.

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Double Punch and Shear.

Capacity—
Shears 8 in. by 1½ in. plate.
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The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. TORONTO 1002 C.P.R. Bldg. VANCOUVER 609 Bank of Ottawa Bldg. WINNIPEG 1205 McArthur Bldg.

The Publisher's Page

TORONTO MAY 15, 1919

What Would You Think of a Manufacturer—

—who wrote to you with a lead pencil—"We are saving much money because we do not use typewriters and telephones"? You might well wonder whether his merchandise was as much out of date as his business methods.

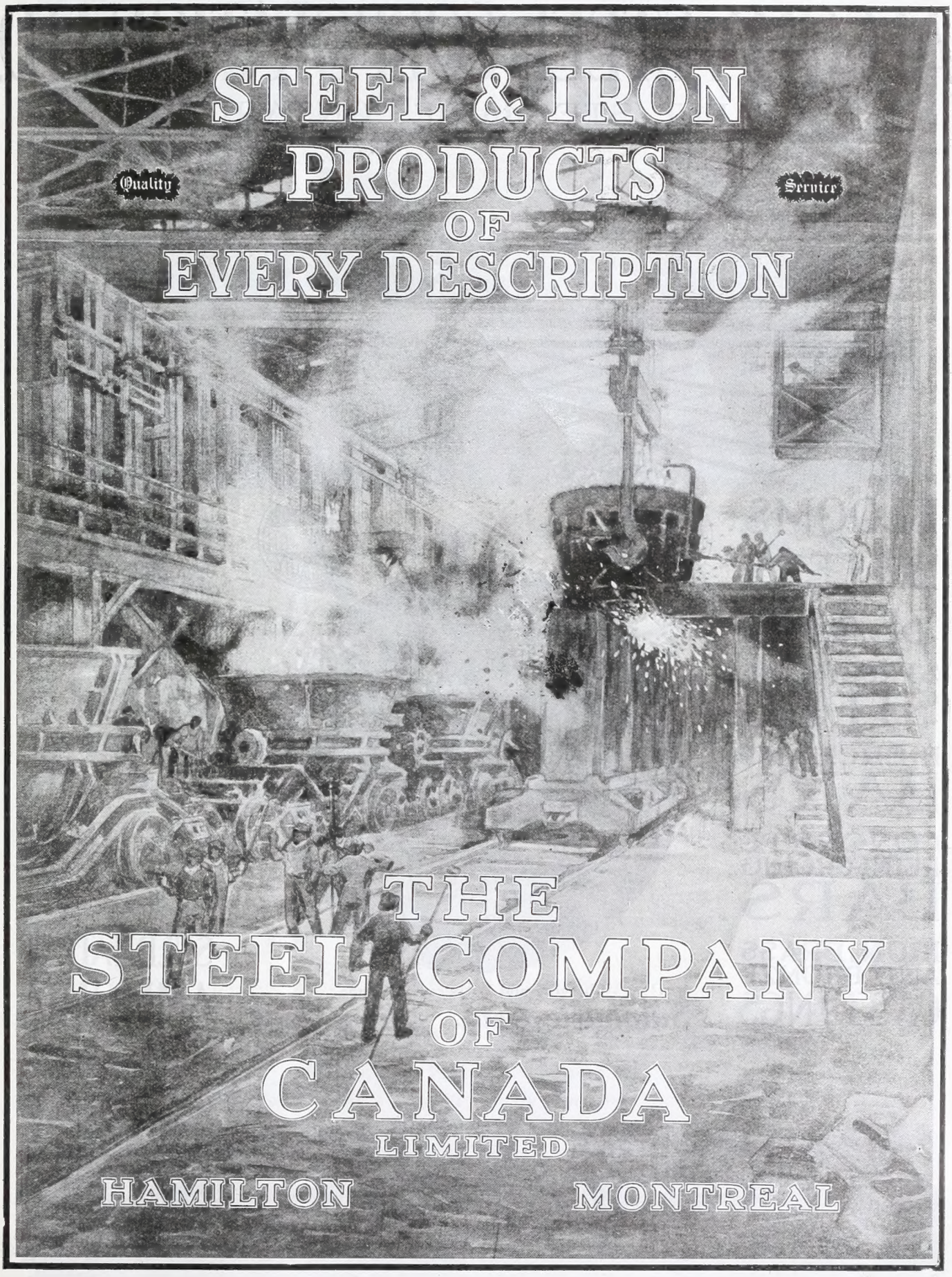
You know that modern time and labor saving appliances are not added expenses, but that they have superseded slower and more costly processes.

The concern which uses your business paper to tell you its business story is simply using a modern piece of selling machinery to make it easier for you to buy intelligently with the least waste of your time and theirs.

For the right kind of advertising shortens the distance between human minds just as certainly as the railroad shortens the distance between places. It is still possible to walk from New York to Chicago, and it is still possible for a business to get along without advertising, BUT—

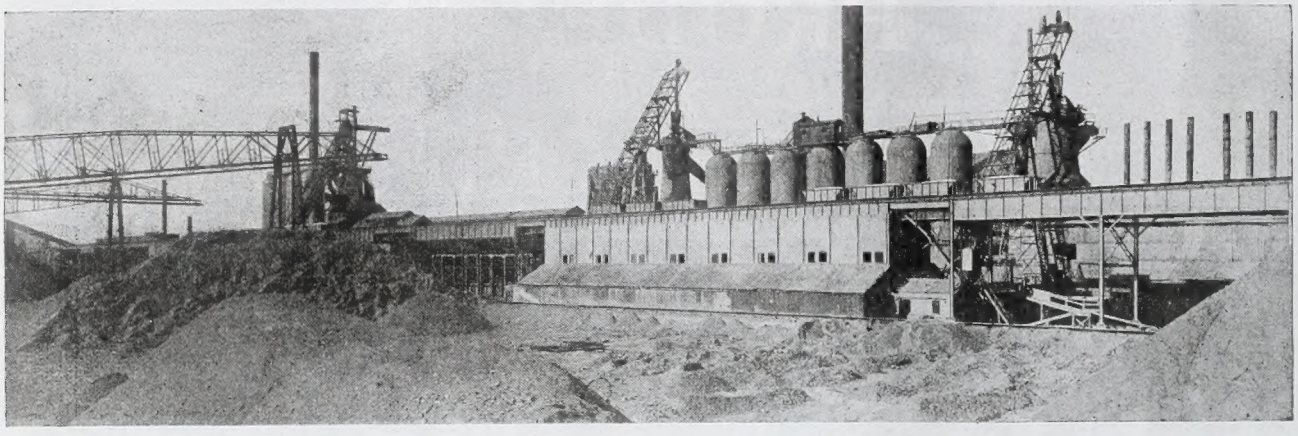
—bear in mind that the seller who does not advertise does NOT save the cost of advertising, for it costs more to do the work of advertising by other means. Consistent advertisers are progressive merchandisers, and it pays to do business with them.—Associated Business Papers.

Canadian Machinery and Manufacturing News, May 15th, 1919. Vol. 21, No. 20. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; United States, $3.50. Entered as second-class matter at the Post Office Deparment, Ottawa, Canada. Entered as nd-class matter at the Post Office Deparment, Ottawa, Canada. Entered asAct of March 3rd, 1879.


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PRODUCTS
OF
EVERY DESCRIPTION
Quality
Service
THE
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ALGOMA STEEL CORPORATION, LTD.

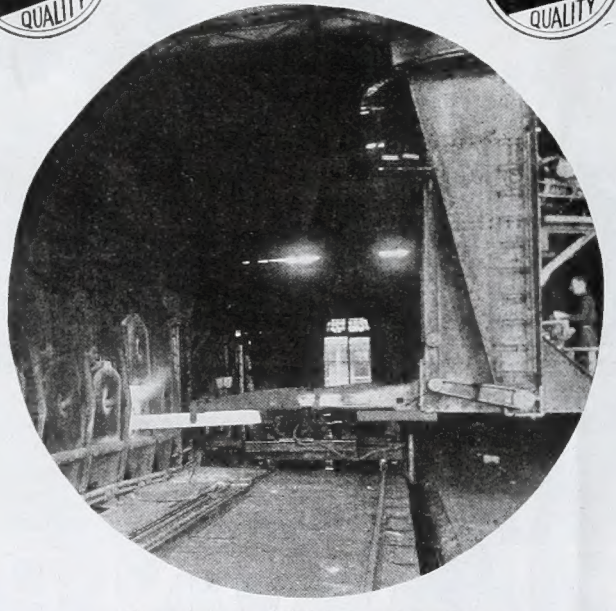
SAULT STE. MARIE, ONTARIO



BLOOMS,
BILLETS,
SLABS,
STRUCTURAL
STEEL
MERCHANT
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MARK OF ALGOMA O.H. QUALITY

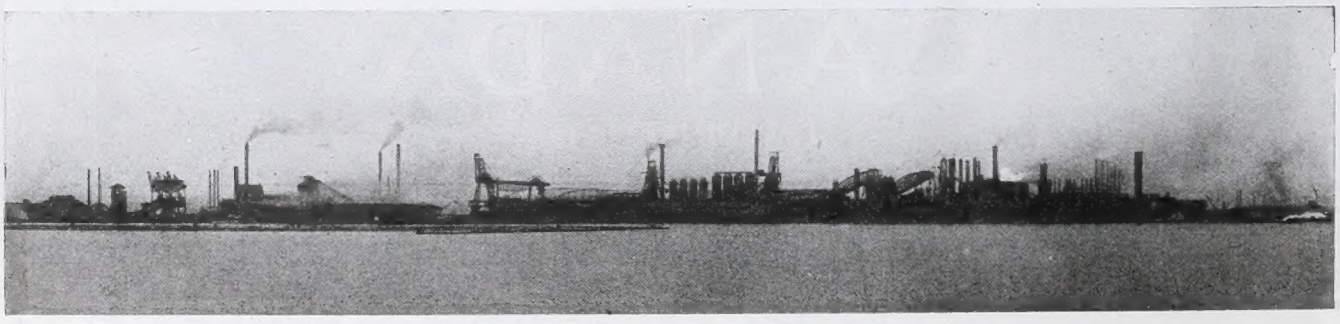
MARK OF ALGOMA O.H. QUALITY



Charging and Withdrawing Crane

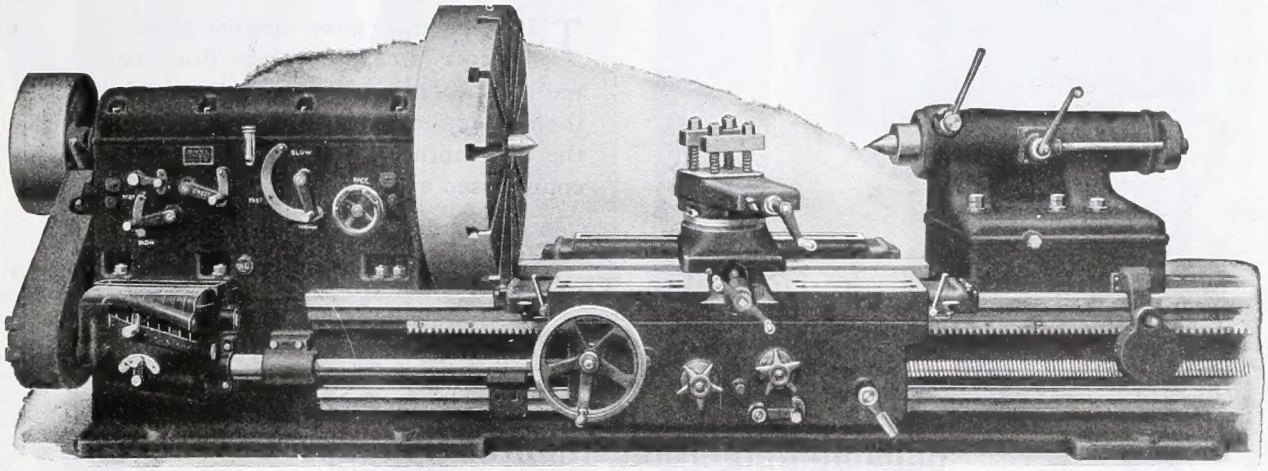
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STEEL
RAILS
Open Hearth Quality
(All Sections from 12 lbs
to 100 lbs per yard)
SPLICE
BARS
STEEL
TIE PLATES
PIG IRON
BASIC, FOUNDRY-
BESSEMER
SULPHATE OF
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GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT

BRIDGEFORD



VALUE

Not the price you pay, but the years of service you get, determines a lathe's cost. The production you get and economy of operation and maintenance are determining factors.

You might buy a lathe at an extremely low price and in doing so pay dearly each month you run it. On the other hand, if you invest a little more money in a Bridgeford lathe you reduce cost of production and eliminate expensive repairs.

Distribute the difference in cost between a real machine built for service and one built to sell at a price and figure out how many times you would pay the difference in what it might appear you have saved.

Just one point for your consideration — Bridgeford Lathes have **all steel gears.** There are numerous other features you should know about.

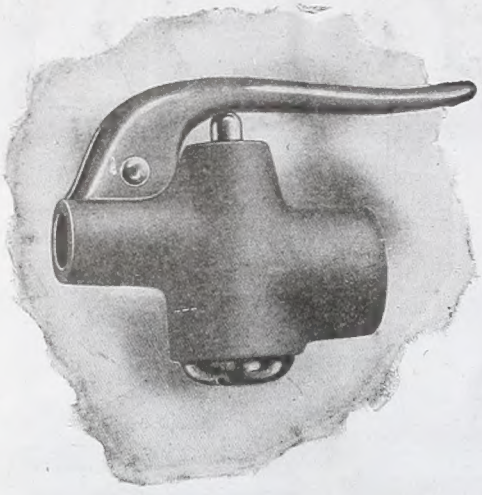
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Manufacturers of Heavy Duty Lathes for more than 20 years

BRIDGEFORD



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THE best insurance against short-circuit and fire risk due to motors becoming dusty is to clean them regularly. For this service there is nothing to equal a jet of compressed air—use the "Blow-gun."

The Blow-gun does not waste air.

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TRADE MARK SS "DOUBLE ESS"

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WOLFRA

MADE IN THE U.S.A.

HIGH SPEED STEEL

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A Keen Cutter

WOLFRAM *Is Both*

Strong in the Neck

VULCAN CRUCIBLE STEEL CO. ESTABLISHED 1900
Aliquippa Pa: U.S.A.
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"Where There's a WILT There's the Way"

WILT

High Speed and Carbon TWIST DRILLS





Reamers and Milling Cutters

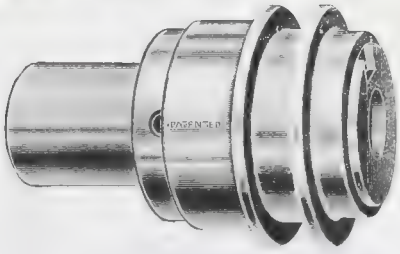
WILT Products are manufactured with the sole purpose of meeting the demand for an absolutely dependable tool of high quality.

WILT HIGH SPEED and CARBON TWIST DRILLS are the kind of tools you can depend upon to give the highest form of service. If you are not getting the satisfaction you would like, adopt the WILT line. They have the quality that gives long and satisfactory service. Give them a trial.

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London Office: **Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England**

THE JOHNSON FRICTION CLUTCH



SINGLE CLUTCH—EXTERIOR



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each being interchangeable. Did you ever see a clutch with so few parts? The Johnson friction clutch is simple, small, compact, round, smooth and powerful. It is the clutch you have been looking for. For the overhead shafting, line shafts or countershafts it gives perfect satisfaction. As a part of the various machine tools on the market it is an important factor. Study the construction of the Johnson Friction Clutch. What are your requirements? Get our booklet, "Clutches as Applied in Machine Building." It shows what the other fellow is doing. Also

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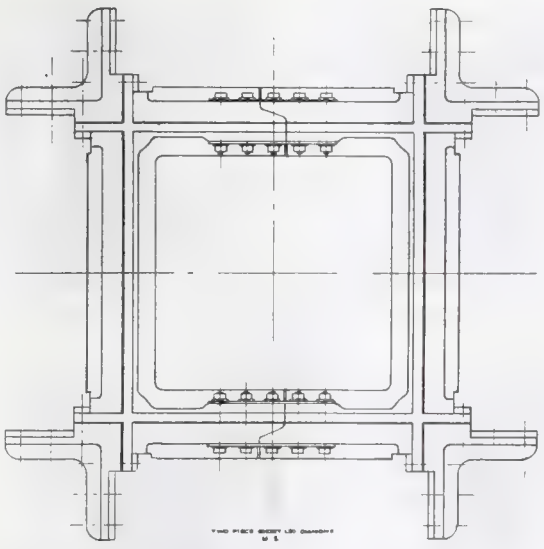
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Electric furnaces, automatically regulated, the most modern methods, and the **introduction of Uranium** — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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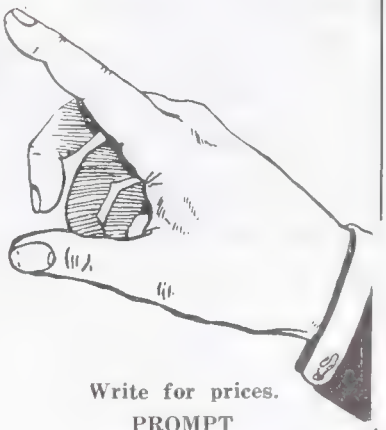
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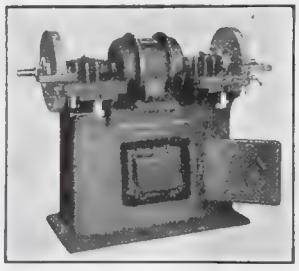
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Sherbrooke, Que.

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Light Type Floor Grinder



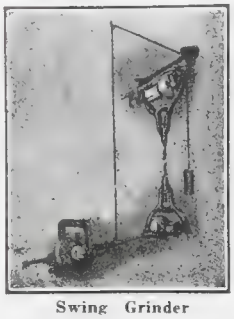
Motor-Driven Grinder



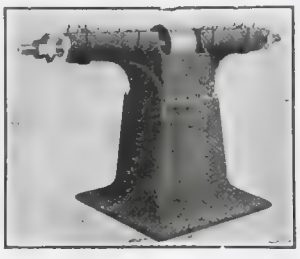
Heavy Type Polisher



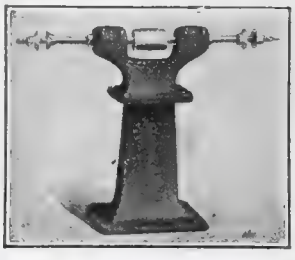
Water Tool Grinder



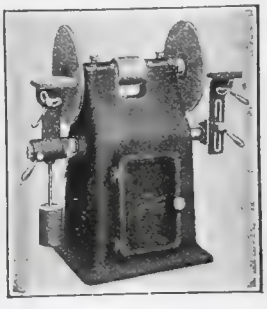
Swing Grinder



Plow Grinder

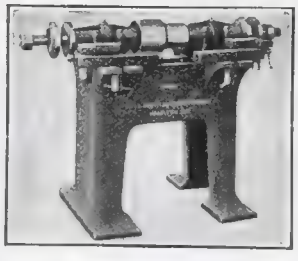


Buffing and Polishing Machine



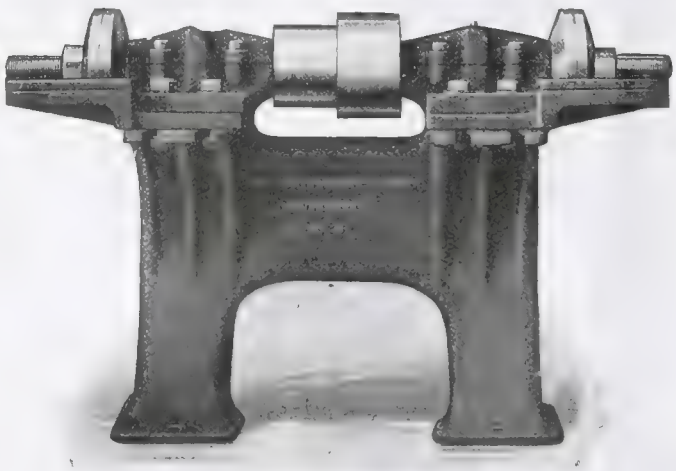
Disc Grinder

Ford-Smith Grinders



Heavy Type Floor Grinder

- Motor Driven Grinders.
- Floor Grinders.
- Bench Grinders.
- Watertool Grinders.
- Swing Grinders.
- Disc Grinders.
- Special Grinding Machinery.
- Hack Saws.
- Swivel Tables.



30" Double End Grinder

Shops taking up new lines of work, or speeding up present production, cutting down costs of manufacture, will do well to consider grinding processes. We have a wide experience which is at your service.

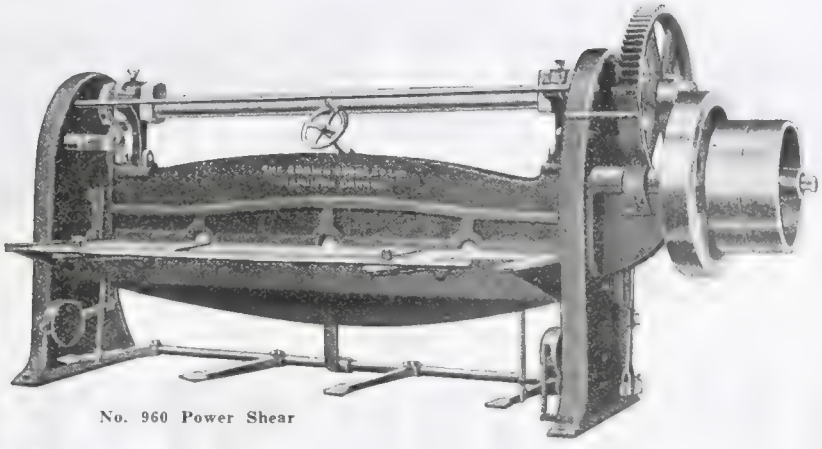
Write us. We can help solve your problems.

The Ford-Smith Machine Co., Ltd.

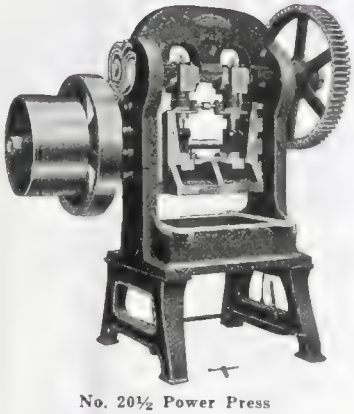
Hamilton, Ontario, Canada

Foreign Agents: W. E. Storey, 3 Arundel St., London, Eng. Alf. Herbert, Limited, 54 Dey St., New York, U.S.A.

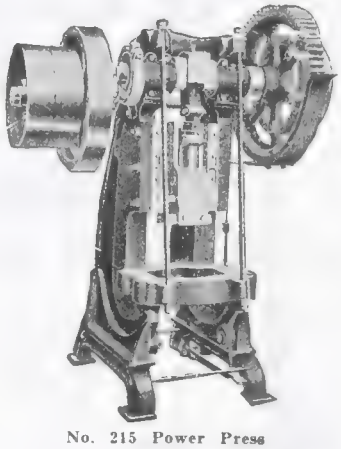
Stood The Test



No. 960 Power Shear



No. 20½ Power Press



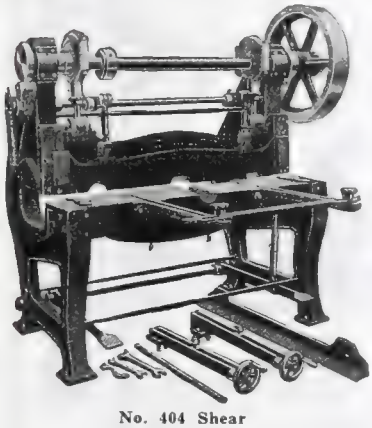
No. 215 Power Press

"B.B." Tools during the last four years have proven their superiority under the most trying conditions.

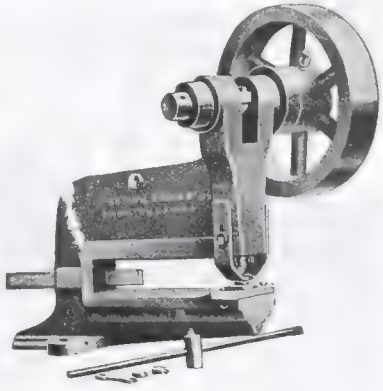
Inexperienced help and 24 hours' daily service will test the best machines.

Quality that is *"built in"* on a machine is bound to assert itself under such circumstances.

Our line comprises shears of all kinds, power presses for punching, forming, embossing, blanking, etc. Tinsmith's tools and sheet metal working machines of every description, also canners' and evaporators' machinery.



No. 404 Shear



No. 100 Power Punch

The Brown-Boggs Co., Limited

Hamilton, Canada

BRITAIN'S BEST

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BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

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CANADA
FOUNDRIES & FORGINGS
LIMITED

A SOLEMN WARNING

A flood of business will overwhelm this country inside of two months. Problems of supply must be met and faced squarely. Those firms who have courage are getting their supplies now. Those who are hesitating are going to receive an awful jolt when they finally decide to proceed with business, because it will be impossible to get service. They will then blame everybody but themselves. Our solemn warning is, "Don't blame us because you didn't see this vision."

Canada Foundries & Forgings, Limited
WELLAND, ONT.

Crucible
AND
Open Hearth Steel

Tool Steel

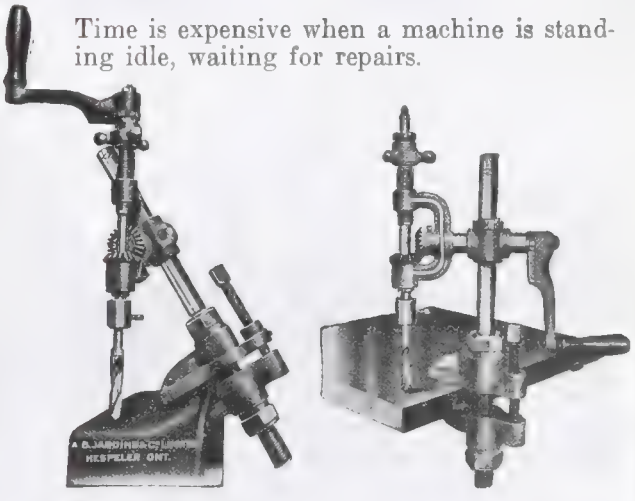
"ARGO" BRAND *HIGH-SPEED* **STEEL**

The John Illingworth Steel Co.
1856
Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

MEN whose souls have been tried in the Crucible of War Time Service will not easily forget those forces, either Human or Mechanical, which were instrumental in achieving Victory.

"Red Cut Superior"

The Nationally Known FIRST QUALITY

HIGH SPEED STEEL

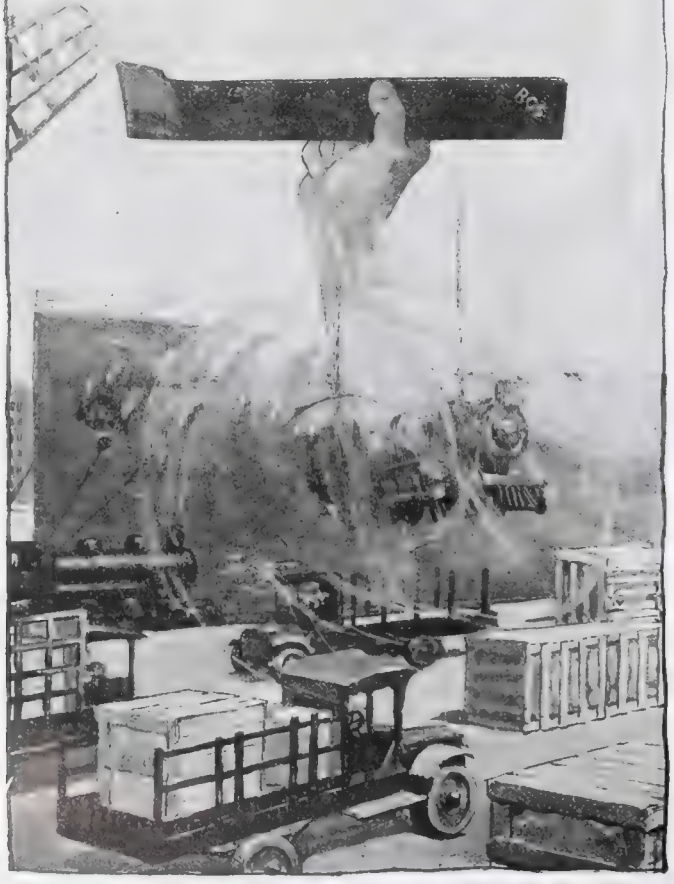
Is a Fighter for Efficiency in Peace Times and War Times.

Are your Tools made of Red Cut?

VANADIUM-ALLOYS STEEL CO.

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Williams' "Vulcan" Drop-Forged Safety Lathe Dogs

DESIGNED to insure the maximum of safety, care was taken to provide a form as close to a circle as possible—no bunching or extension of the head portion, no "sleeve-catchers" to cause injury to the unwary operator.

They provide safety complete and automatic and, with this assured safety, better balance on the lathe and every whit of utility obtainable in this class of tool.

The price is the same as for the dangerous kind.

Bent and Straight Tail, 1 or 2 Screws, 16 Sizes, 3/8 to 6-inch Capacities.

Ask for Machinists' Tools Booklet

J. H. Williams & Co.

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THE A. G. LOW, CO., LIMITED
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Agents for Manitoba, Saskatchewan, Alberta and British Columbia



Cranes for all Purposes

LINK-BELT Locomotive Cranes are rendering highly efficient service in leading industries throughout America.

They are handling ore at foundries. Handling steel at fabricating plants. Handling small parts with electric magnets at factories. Handling coal and ashes at power plants. Handling steel in ship yards—in fact wherever heavy parts or assembled products are to be handled economically and with dispatch, there you 'll find Link-Belt Locomotive Cranes on the job.

And in each case you 'll find them rendering a highly satisfactory service. For back of Link-Belt Cranes is one of America's leading engineering organizations. Each crane is of the highest standard throughout—the same high standard which has long characterized Link-Belt products and made the name Link-Belt a guarantee of quality and efficiency.

Send for our Crane Book No. 370. Gives complete details.

CANADIAN LINK-BELT COMPANY, LIMITED

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TORONTO

220

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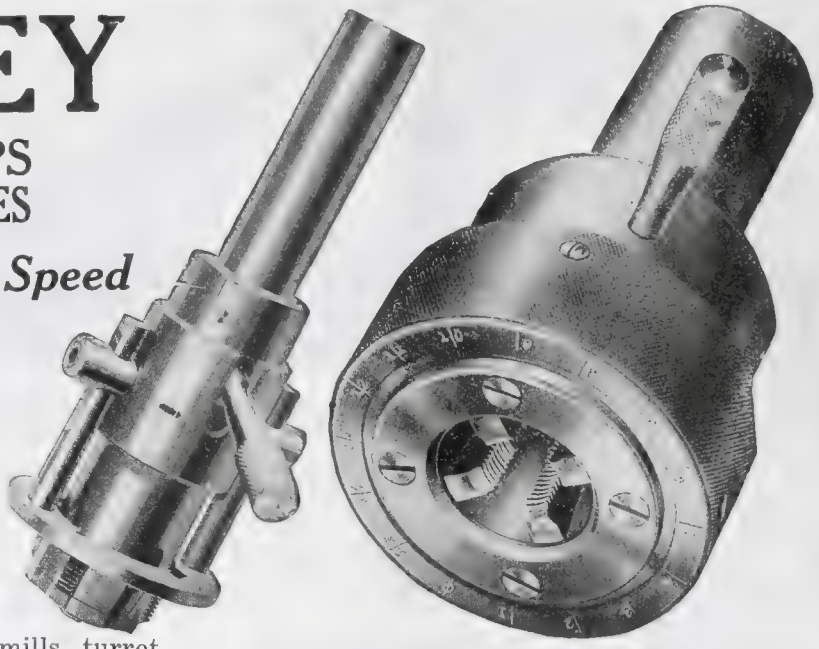
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LINK-BELT
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MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed

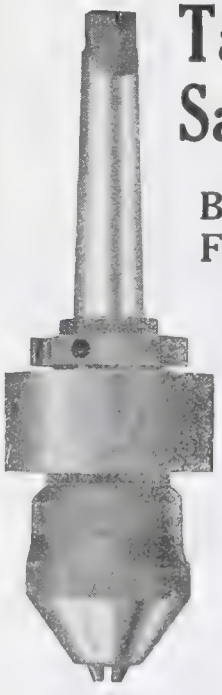


MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and on all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the cost.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.



Tap Chucks that Save Tap Costs

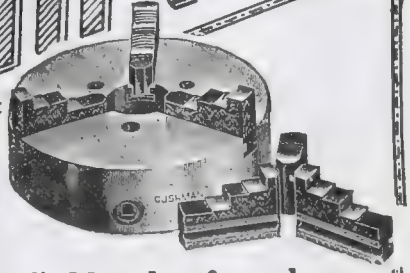
BICKNELL-THOMAS FRICTION CHUCKS

reduce tap breakage to the vanishing point. These chucks will hold the tap to the limit of its endurance, but a sudden strain sufficient to break the tap wil cause the grip to loosen instantly. They are particularly adapted for tapping to the bottom of blind holes, for special work and—owing to their compact design—for use on multiple spindle machines.

Made in four sizes—one-eighth to one inch. Straight or Morse taper shanks.

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GREENFIELD, MASS, U. S. A.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

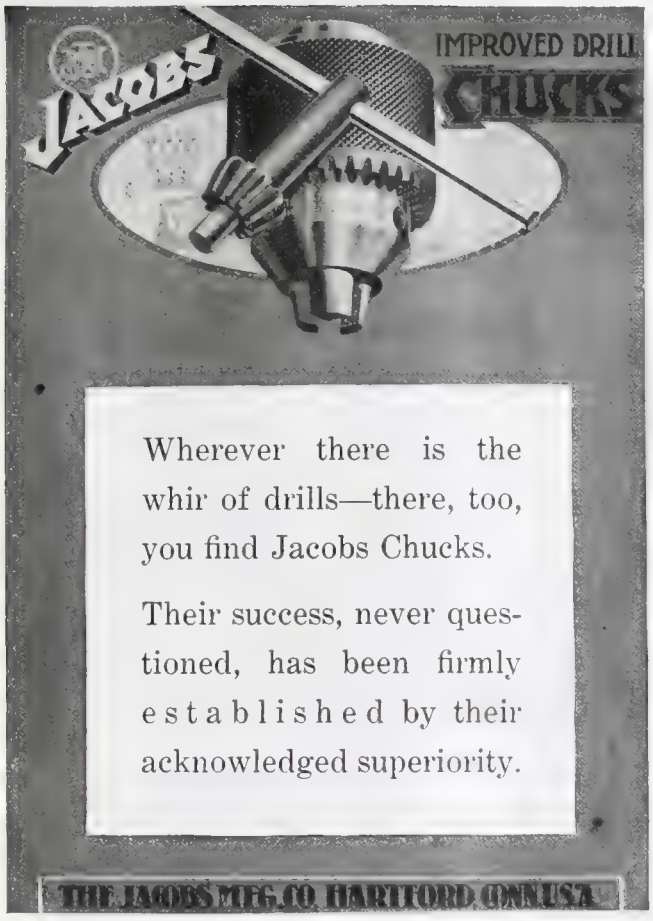
And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

Cushman Chuck Co., Hartford, Conn.

CHUCKS



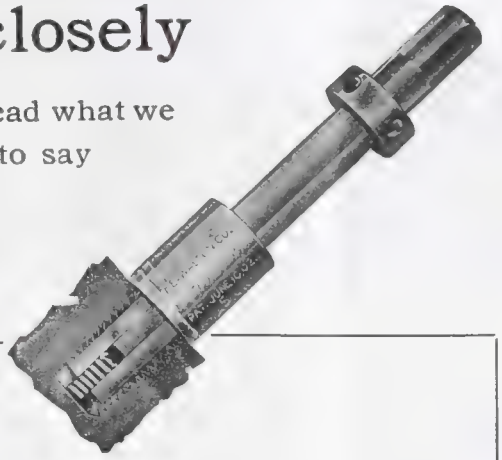
Wherever there is the whir of drills—there, too, you find Jacobs Chucks.

Their success, never questioned, has been firmly established by their acknowledged superiority.

THE JACOBS MFG. CO. HARTFORD CONN. U.S.A.

Look at this again —closely

and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company

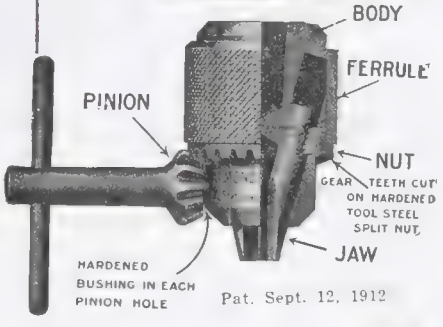
Hartford, Conn.

ALMOND CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



Geared Nut Drill Chucks, in various capacities, 0″ to 1″.

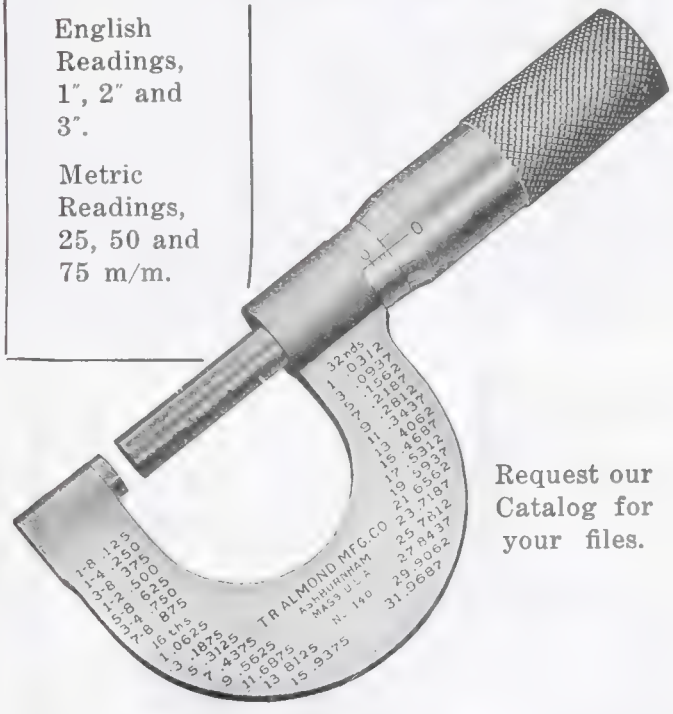


Pat. Sept. 12, 1912

Micrometer Calipers—

English Readings, 1″, 2″ and 3″.

Metric Readings, 25, 50 and 75 m/m.



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Die Head Cuts
Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or aeroplane plant for certainty.

Made in 9/16", 1", 1½" and 2" sizes.

No stronger, more durable, more accurate Die Head was ever made.

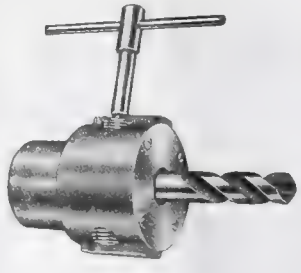
on Nickel Steel



Ask for Catalog

Eastern Machine Screw Corp.

New Haven - Conn.



UNION
POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best of results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION Manufacturing Co.

New Britain, Conn.

New York Office 26 Cortland St.

Makers of a complete line of chucks

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada

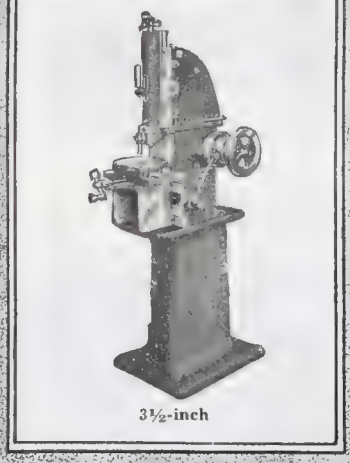


THREE AND ONE-HALF AND FIVE-TON "FLUID COMPRESSED" STEEL INGOTS.

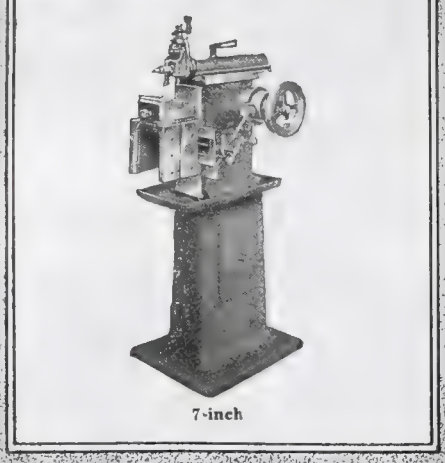
The Nova Scotia Steel & Coal Co., realizing the importance of "fluid compression" as a valuable aid in producing reliable and first-class steel products, procured by purchase the Canadian license from M. Harmet, of St. Etienne, France, whereby they own the sole rights in this Country to use his process. This they considered in accordance with their policy of taking advantage of every important metallurgical development, thus advancing with modern progress, and particularly that their high reputation as manufacturers of the best marine, railway and machine forgings obtainable should be maintained.

The "fluid compression" plant laid down at Sydney Mines, N.S., consists of one group of four Harmet presses, each of 1,250 tons and capacity to handle 3½ to 5-ton ingots; and one of 4,000 tons to handle ingots up to 30 tons.

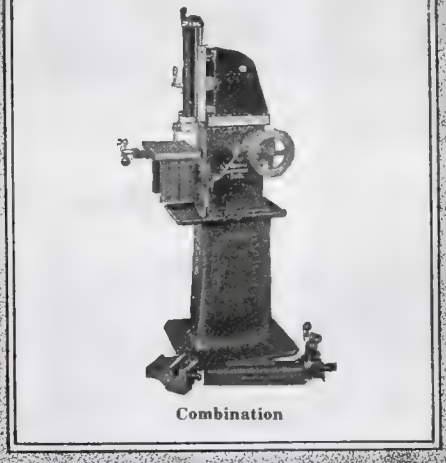
The product of this process is used in the manufacture of high-grade forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armor plate of the highest grade; in fact for all commodities in which maximum reliability and homogeneity of structure enter and are demanded.



3½-inch



7-inch



Combination

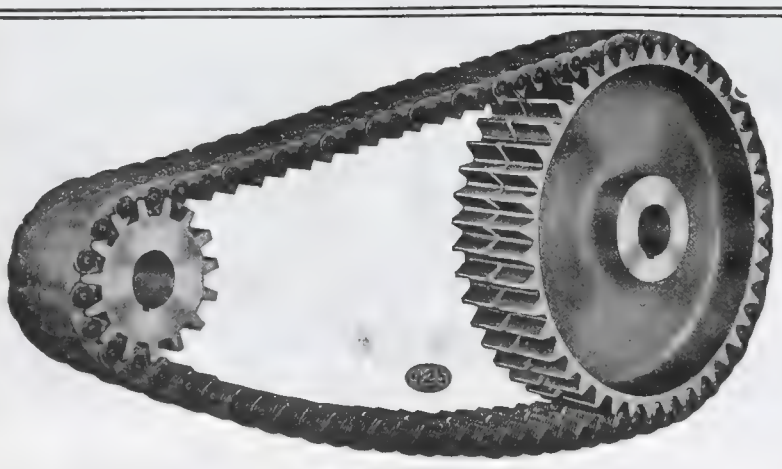
Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

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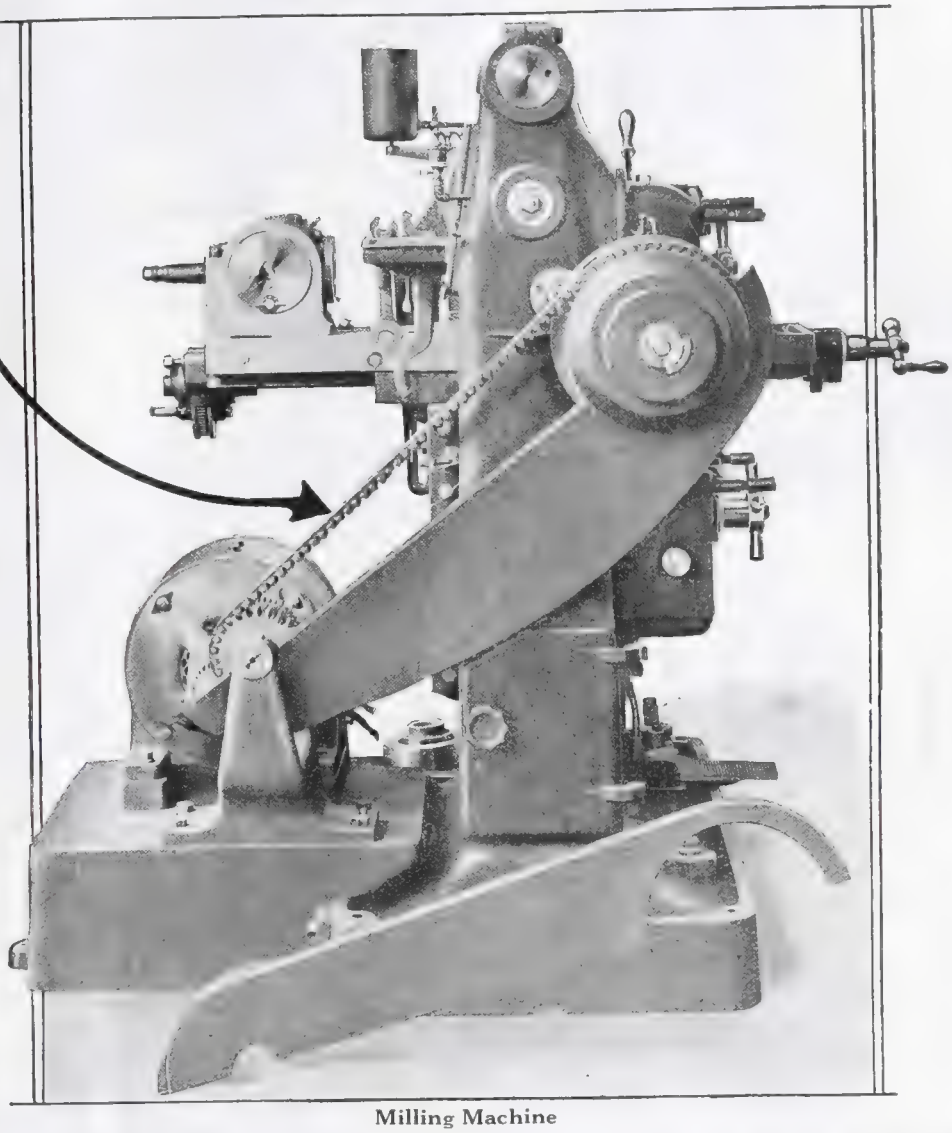
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The drive that will do the most work, the steadiest work, the best work. Made for every purpose from ¼ H.P. to 5,000 H.P. Adopted by engineers as durable, simple, unaffected by heat, cold, oil or moisture. Let us have your general lay-out and design your drives to suit your special conditions.

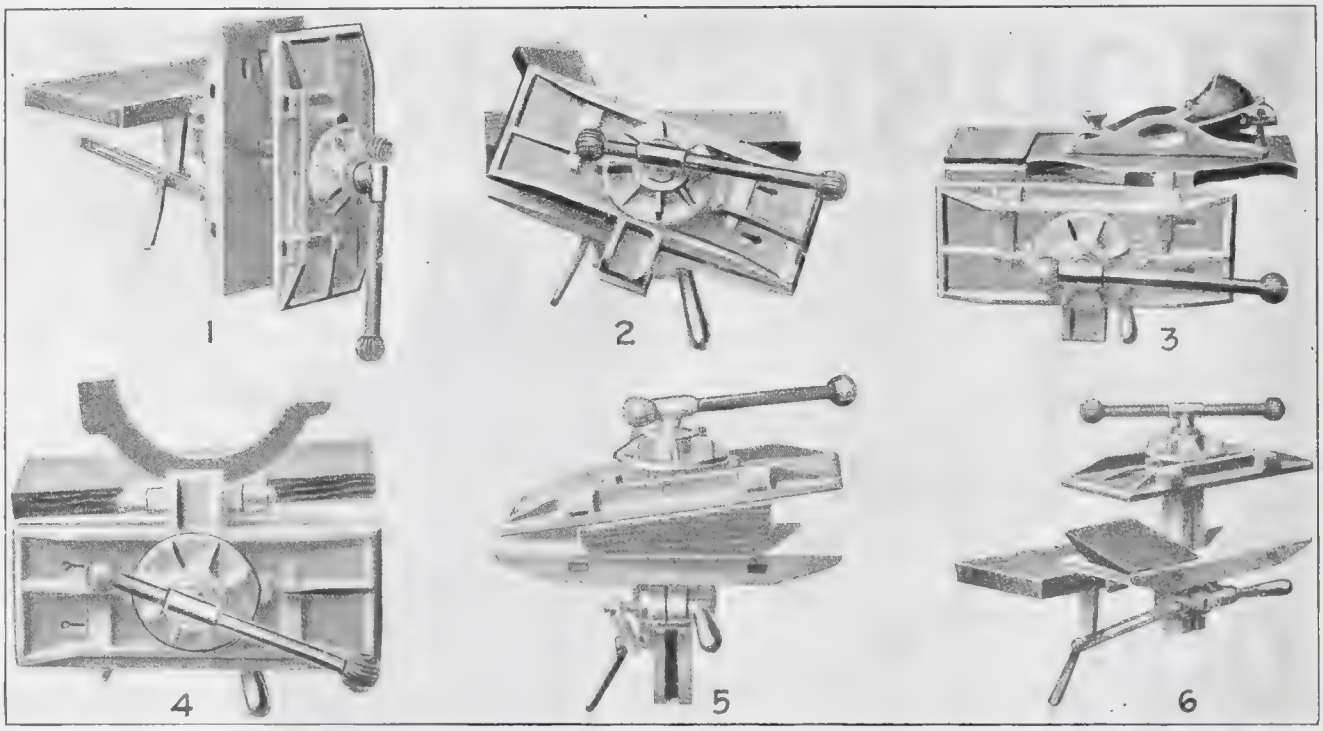
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THE VICTOR VISE

A GLANCE at the illustrations above gives some idea of the versatility of the New Victor Universal Wood Workers' Vise. No position is impossible for this handy tool. Has all the features of a standard vise.

All parts are interchangeable and it is sturdy and strong, yet only weighs 75 lbs. Can be set at any point within the arc of a circle without loosening work in jaws.

Holds any irregular or wedge shape, and will positively hold it securely. **Every pattern-making and woodworking shop can save time and money with the Victor.**

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Canadian Agents: Williams & Wilson, Ltd., Montreal

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"Trojan"
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Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

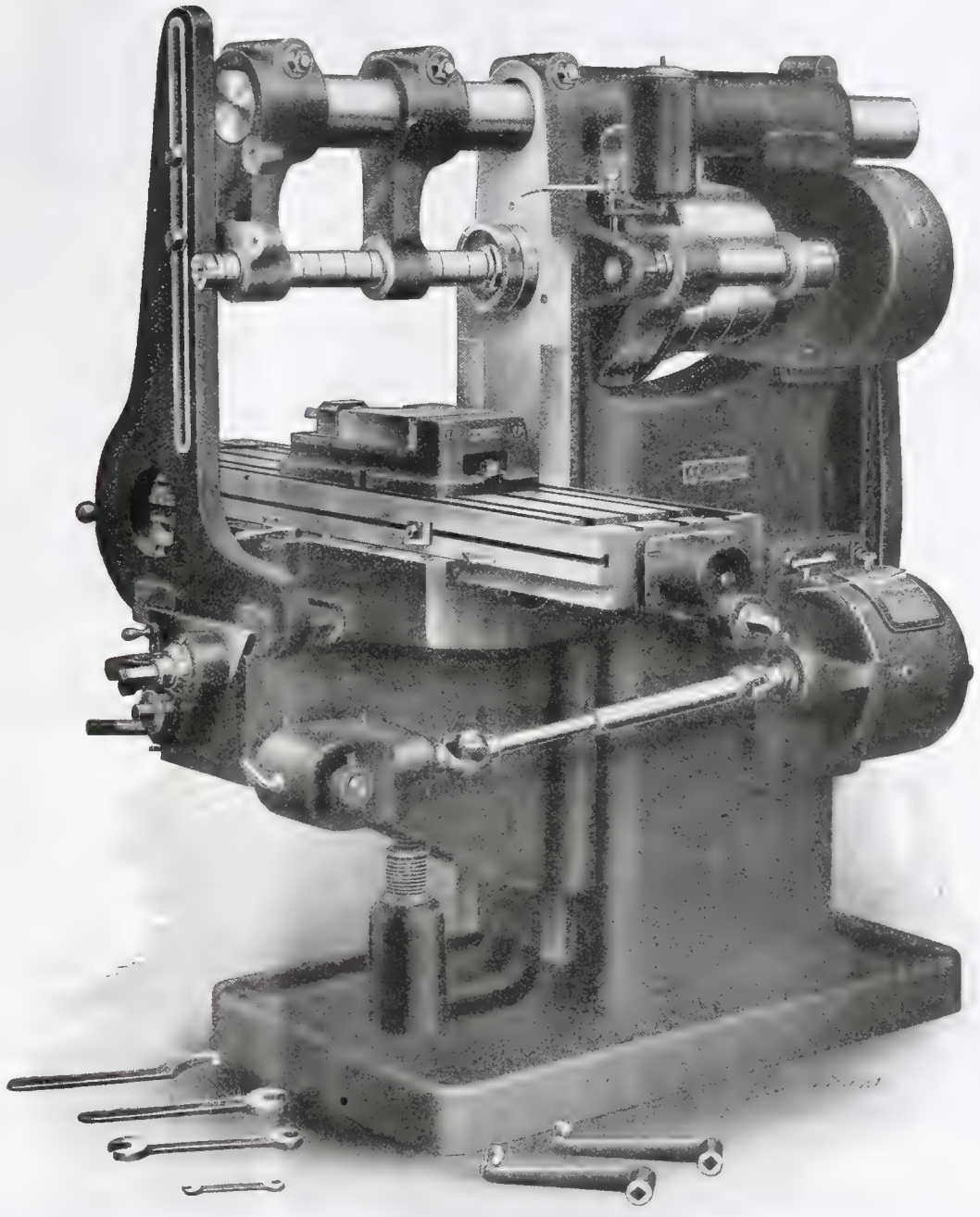
Annual sales over $5,000,000.



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New York, N.Y. London, Eng. St. Louis, Mo.

KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

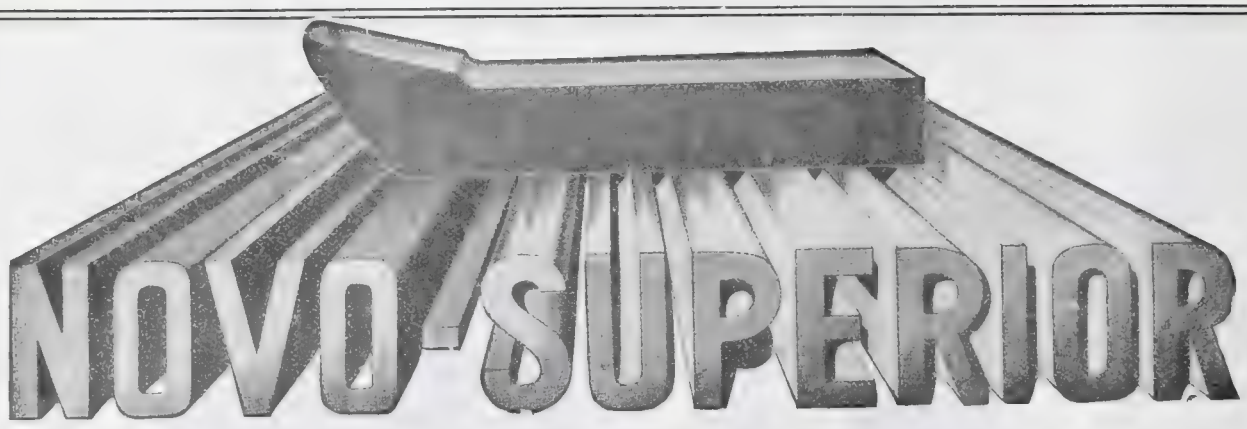
Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our Catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

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Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

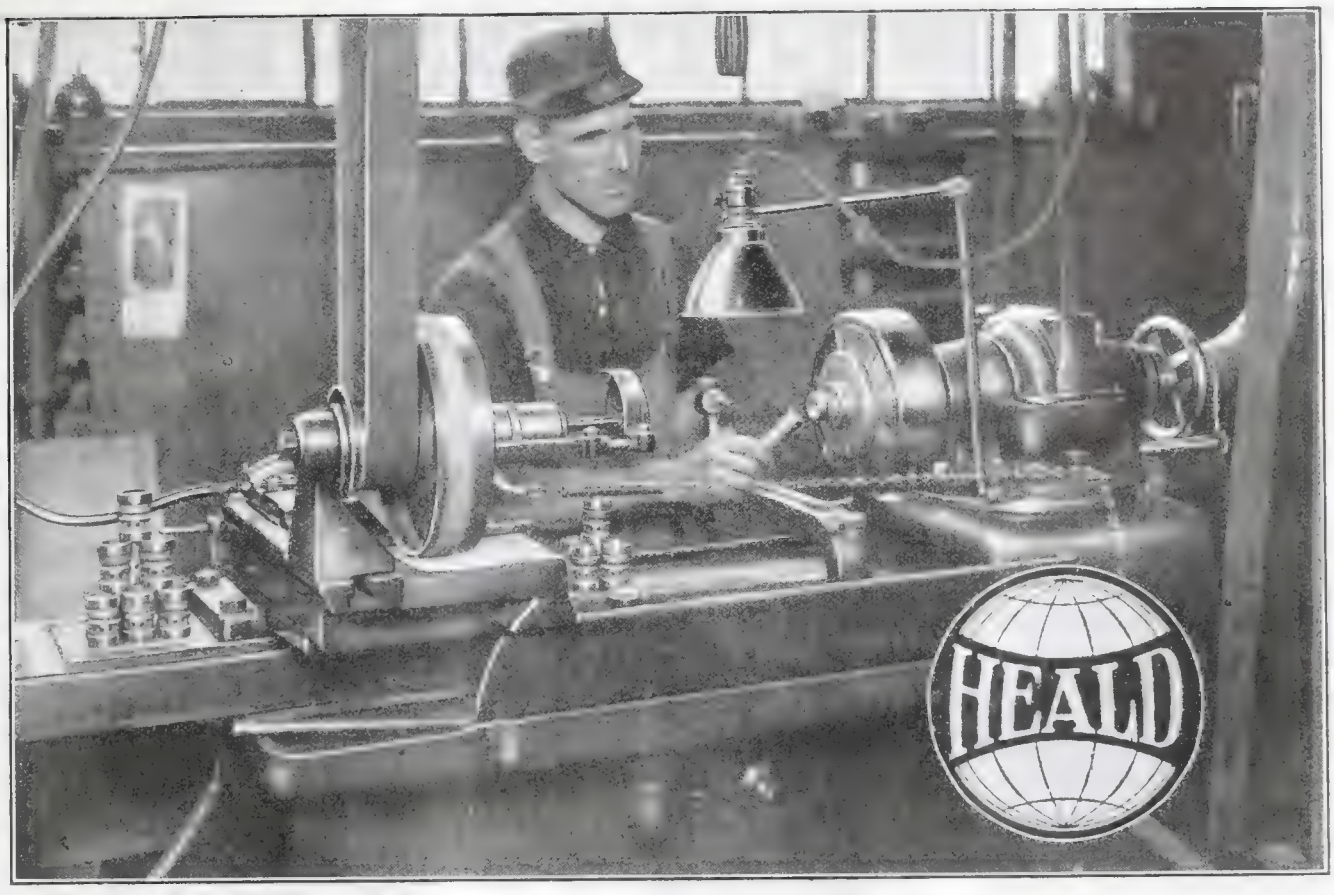
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INTERNAL GRINDING

These photographs were taken at the plant of The Ingersoll-Rand Company, Athens, Pa.

The upper one shows a Heald No. 70 Internal Grinder grinding a blind hole in bushing. At the left of the picture can be seen a supply pipe for air cooling and on the right an air suction for taking out the dust. Notice how carefully the operator's hand is protected from injury while plugging the work by the Heald automatic wheel guard.

The lower photo gives an idea of the variety of work that can be ground on a Heald No. 70 at one plant. This machine can be equipped with different style wheel heads, instantly interchangeable, giving the widest range in diameter and length. The work head swiveling to 45° or 4-in. taper per foot makes angular work simple. A radius truing device which can be furnished will form the wheels as desired and makes ball bearing races and all work requiring curved surfaces ideal work for this machine.

Inquire--It Will Bring Results.

The Heald Machine Co.

WORCESTER, MASS.

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Variety of Work Done on Heald No. 70 at One Plant

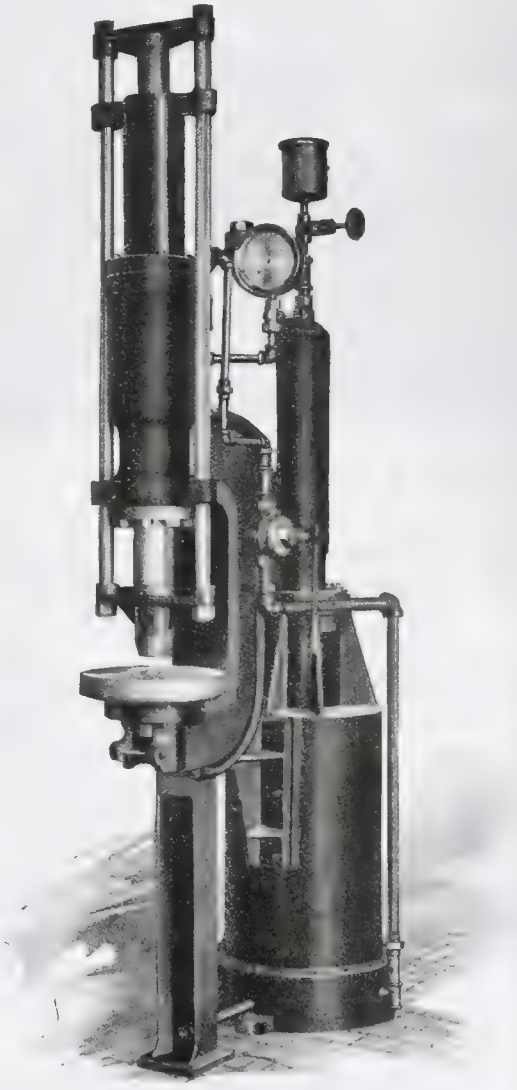


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is Characteristic Always of

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DESIGNS and
DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

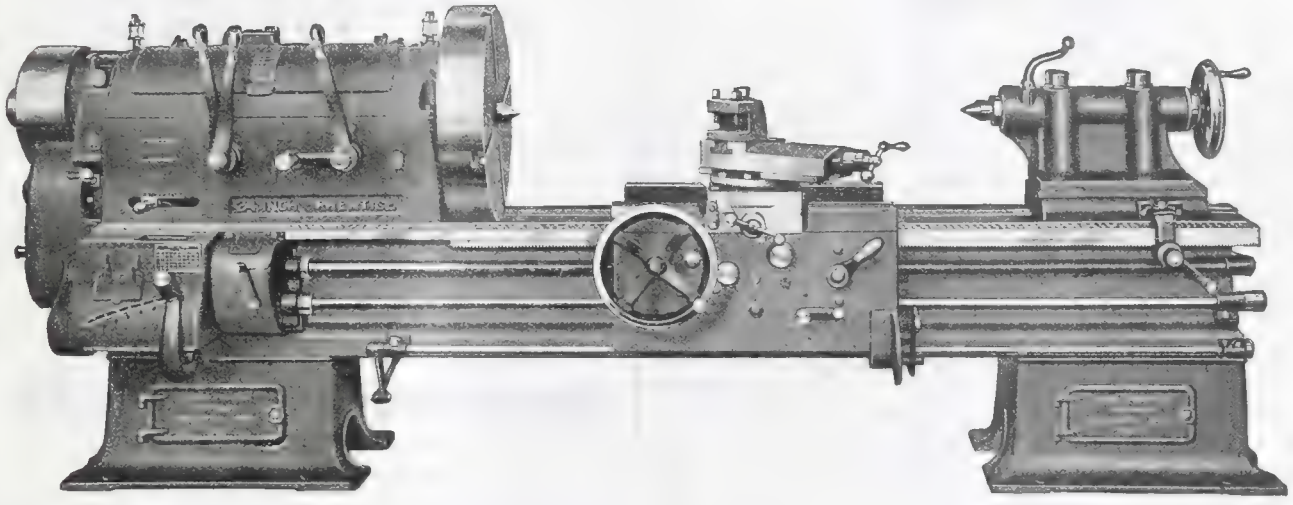
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THE "PRENTICE" GEARED HEAD LATHE HAS ALL THE GEARS IN THE HEAD CONSTANTLY IN MESH THE FULL WIDTH AND DEPTH OF THE TOOTH. THE VARIOUS GEAR RATIOS BECOME OPERATIVE BY MEANS OF INDIVIDUAL METAL TO METAL EXPANDING FRICTION CLUTCHES.

THESE FRICTION CLUTCHES GIVE PRACTICALLY A POSITIVE DRIVE WHEN IN FULL MESH BUT SLIP FOR AN INSTANT AT THE MOMENT OF LOAD TAKE-UP. THIS RELIEVES THE GEAR TEETH OF ALL SUDDEN JAR OR STRAIN. THE SHOCK IS CUSHIONED.

THIS EXCLUSIVE "PRENTICE" LATHE FEATURE IS TO A GREAT DEGREE RESPONSIBLE FOR ITS SPLENDID REPUTATION—"THE LATHE CAPABLE OF GIVING YOU THE GREATEST PRODUCTION WITH THE LEAST EFFORT."

WE WILL BE GLAD TO DEMONSTRATE THIS FACT TO YOU.

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MANNING, MAXWELL & MOORE, INC,
FENWICK FRERES

Notes on Grinding

NORTON COMPANY, WORCESTER, MASS.

No. 43A

Wheel Speeds In Saw Sharpening

When saws begin to show cracks, when they begin to case-harden, and when other things go wrong in the filing room, even though a wheel may be satisfactory until the trouble starts, it is usually the grinding wheel which receives the blame, because no other reason for the trouble can be found.

However, the average filer must be given credit for becoming more educated every day with regard to grinding wheels. He is learning to look upon his wheel as one of his tools and is beginning to treat it as such.

Wheel speeds cannot be depended upon in a filing room where the machinery is run by individual steam engines. The steam line as a rule is connected with the same line as that which furnishes steam for the carriage gun. The number of machines used controls the steam supply and power delivered. A change of 200 to 300 r.p.m. of the wheel may result from a change of only one or two revolutions of the steam engine. When it is realized that a change of 500 surface feet will show an appreciative effect in grinding action, it can be seen that this change is a vital one. Generally speaking, a wheel will act considerably harder as the speed increases.

The generally accepted correct speeds for wheels, the sizes of which are usually used in saw gumming work are listed below. These speeds will give approximately 5000 s.f.p.m.

Wheel Speeds

Diameter	R.P.M. for 5,000 S.F.P.M.
6	3,200
8	2,400
10	1,900
12	1,600

With the use of Alundum wheels saw sharpening troubles are minimized.

NORTON COMPANY

Canadian Agents—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. E. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

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NEW YORK STORE 151 CHAMBERS ST. CHICAGO STORE 111 NO. JEFFERSON ST.

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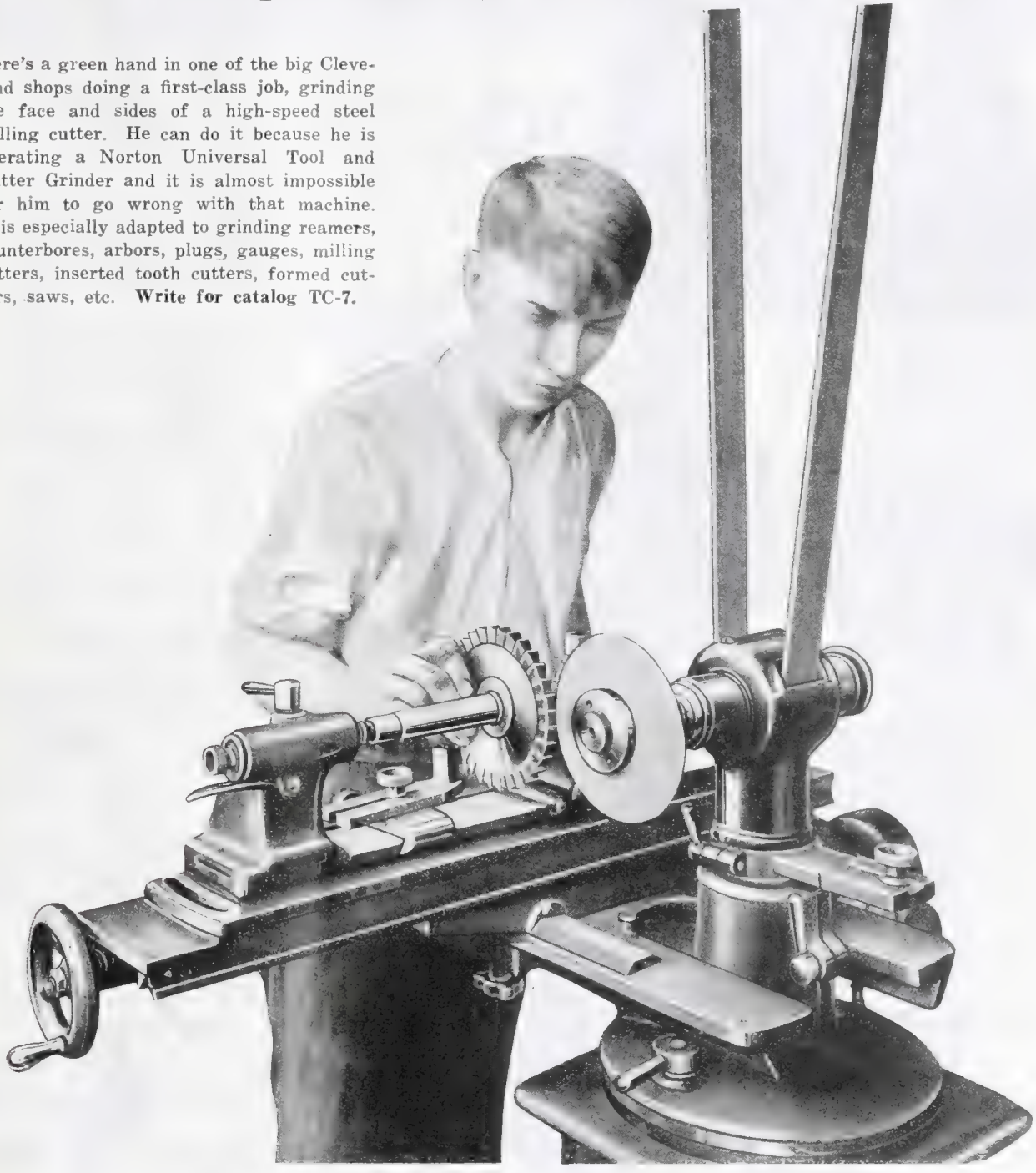
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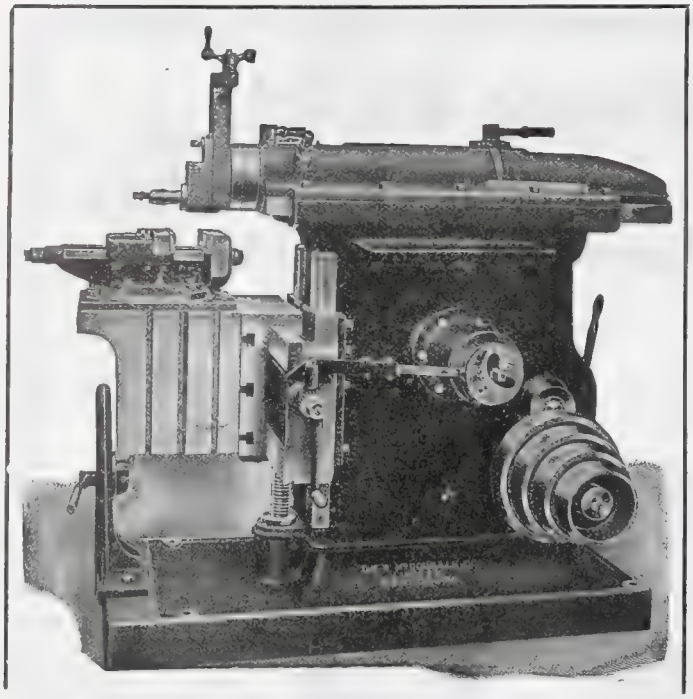
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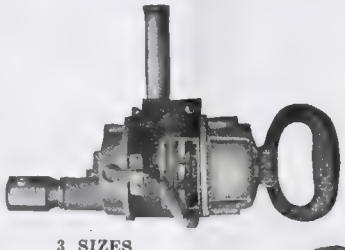
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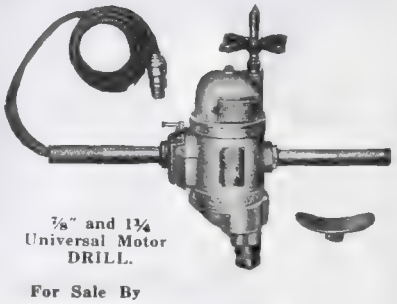
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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXI. No. 20. May 15, 1919

Manufacturing Banner Hosiery Machine--Part IV

A Continuation of the Preceding Parts on the Manufacture of This Interesting Machine

By ROBERT MAWSON

THE frame is the largest element used on the hosiery machine, and in order to obtain intensive and duplicate manufacture, many interesting operations are involved.

It might be well to cite a very interesting procedure which the Hemphill Co. have adopted and which could be followed to advantage by many manufacturers of small machines and tools. This practice is to dip all the castings for machine in enamel, which is afterwards baked in ovens before any machinery operations are performed on them.

The advantage of this method is obvious, as the enamel covers every part of the casting, thus acting as a preservative and also avoids the covering of machined portions, as these occur in operations which follow.

When the usual way of enameling after the machinery is done is resorted to, a longer time is required and often many portions are left uncovered, as the man must be careful to avoid placing enamel on the portions which have been machined.

The half-tone, Fig. 1, shows two Whitcomb planers machining the two sides of the frame. The casting for each operation is placed on the machine table, stops being set into holes of the table to resist the cutting strains exerted during the machining of the frame.

Clamps are also tightened on the pieces to hold them rigidly during the time they are being planed.

The rest of the set-up and work performed is obvious from the illustration.

In Fig. 2 is shown a Kelly shaper machining the top surface of the frame.

The fixture used is in the form of a stand, on which the frame casting rests.

The wooden clamp shown is used to hold the casting against the vertical face of the shaper table.

Fastened to the horizontal face of the table is a strap which extends out and its free end is curved. This curved portion is used as a brace to resist the machining stresses exerted by the shaper tool during the facing operation.

Boring Main Shaft Bearing

The half-tone, Fig. 13, shows the fixture and method used when boring the main shaft bearing. This hole must be in a certain relation as regards height from the top of the frame, and the method used to insure this condition will be shown in our next illustration, Fig. 4.

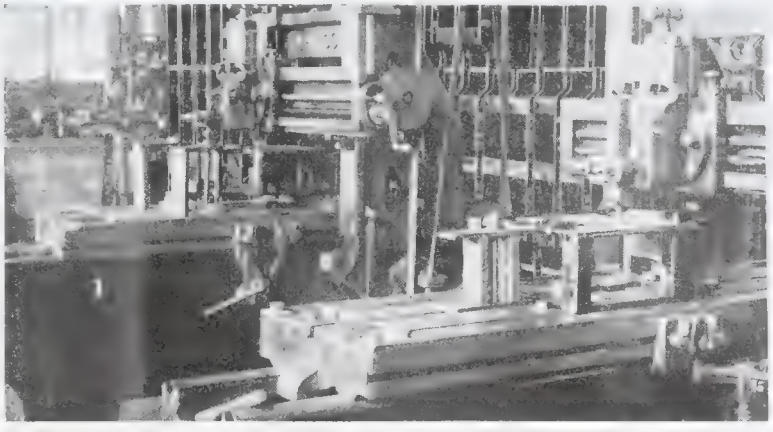


FIG. 1 MACHINING THE TWO SIDES OF THE FRAME.

The arbor A is made with a similar taper to that of the machine and is placed in the spindle of the milling machine.

The gauge body B is then placed on the top surface of the fixture plate on which the frame rests.

The milling machine table is then adjusted for height until the arbor will slide through the hole C, with the gauge body resting on the fixture.

The operator then knows positively that the hole bored will be at the correct height in relation with the top surface of the frame.

The gauge and arbor are then removed from the milling machine and the frame fastened on the fixture by means of the straps, as illustrated in Fig. 3.

The operator then places the boring bar shown in position into the spindle of the machine.

He next moves the table longitudinally until the bar is central in that direction with the cored hole of the frame casting.

The table is then locked, so that it cannot travel in a longitudinal direction, and the two holes bored, using one point cutters for both holes.

One of the plug gauges used to test the correctness of the holes is shown in Fig. 4 at D, this one being for the rear bore. A similar plug gauge is also employed for the front hole.

The rear hole is 2⅝ in. in diameter, and the front bore is 1⅝ in. in diameter.

Milling the Frame

The illustration, Fig. 5, shows a horizontal milling machine milling the 1¼ in. slot for the upright bar.

This operation is very important, as upon its accuracy depends much of the success of the hosiery machine when in operation.

The frame is located on the milling machine table by means of a plug, which is fastened to the machine and fits into the 2⅜ in. bored hole. This method of locating determines that the slot will be central with this bored hole. It must also be at right angles with both bored holes, so as to ensure this condition. The frame is fastened rigidly on the milling machine table. There is yet a third function it must possess, namely, the slot must be absolutely square and at right angles with the top of the frame. To meet this requirement the angular brace shown in front of the milling machine table is used.

This brace is made with a long tongue,

which fits perfectly in the slots of the milling machine table.

This brace is then slid along until the vertical edge comes against the top of the table, which, in the position it occupies during the machining operation, is vertical.

The table casting is, therefore, swivelled on the locating plug until the faces of brace and table are in contact on their entire surfaces.

The brace is then fastened down by means of the bolt seen under the casting.

The table casting is also fastened down by means of clamps on the table of the milling machine, as noted.

The piece is then in condition for milling the slot, the operator being sure that the three conditions demanded will be met with. The gang set-up of cutters used may be observed by referring to the half-tone.

It will be seen that the 1¾ in. slot is machined; also the two surfaces on each side of the slot in the one operation.

The operator raised the table until the correct depth of slot is obtained, testing the same by means of a depth gauge.

Testing the Frame

The half-tone, Fig. 6, shows the gauge used to test the accuracy of the machining on the frame.

The gauge consists of a shaft made with two diameters, which fit accurately the two bored holes.

The element B is a rectangular bar 1¼ in. wide, which is made so that it will have a good sliding fit in the two slots at the top and bottom of the frame.

This rectangular bar also fits in a 1¼ in. slot in the yoke part C of the gauge.

It will be noticed that arm of the yoke has a reamed hole at the upper, into which the main shaft arbor is placed.

To pass inspection the gauge must be in the position shown, the arbor through both bored holes, the arbor in the hole of the yoke member and the rectangular bar fitting in both the slot in the casting and also slot in yoke.

The rectangular bar is then slid up and down to see that it works freely in the slot and the arbor is revolved, and it must also have a similar freedom of action.

If the test gauge will perform this dual function, it proves that the operator has used the fixtures properly and that the work has been correctly done.

A similar fixture gauge is used in a subsequent operation for the final test, great care being taken on this part of the machine, so that accuracy is obtained, both during the machining of it and also inspection for acceptance.

We now come to the drilling operations on the frame, and it will be seen that simple plate jigs are used for these operations.

This is somewhat contrary to what is the common practice in many plants. Many shops follow the method of making one large jig to take care of all the holes in a casting of this nature.

There are arguments for and against each type of jig and their resultant method.

Where one jig is used there is this argument for the practice: That chances of errors are minimized, providing that the casting is placed correctly in the jig.

On the other hand, the tool is far more expensive to make for first cost, and repairs to the same are also higher, and usually more skilled help is necessary for the proper using of the same.

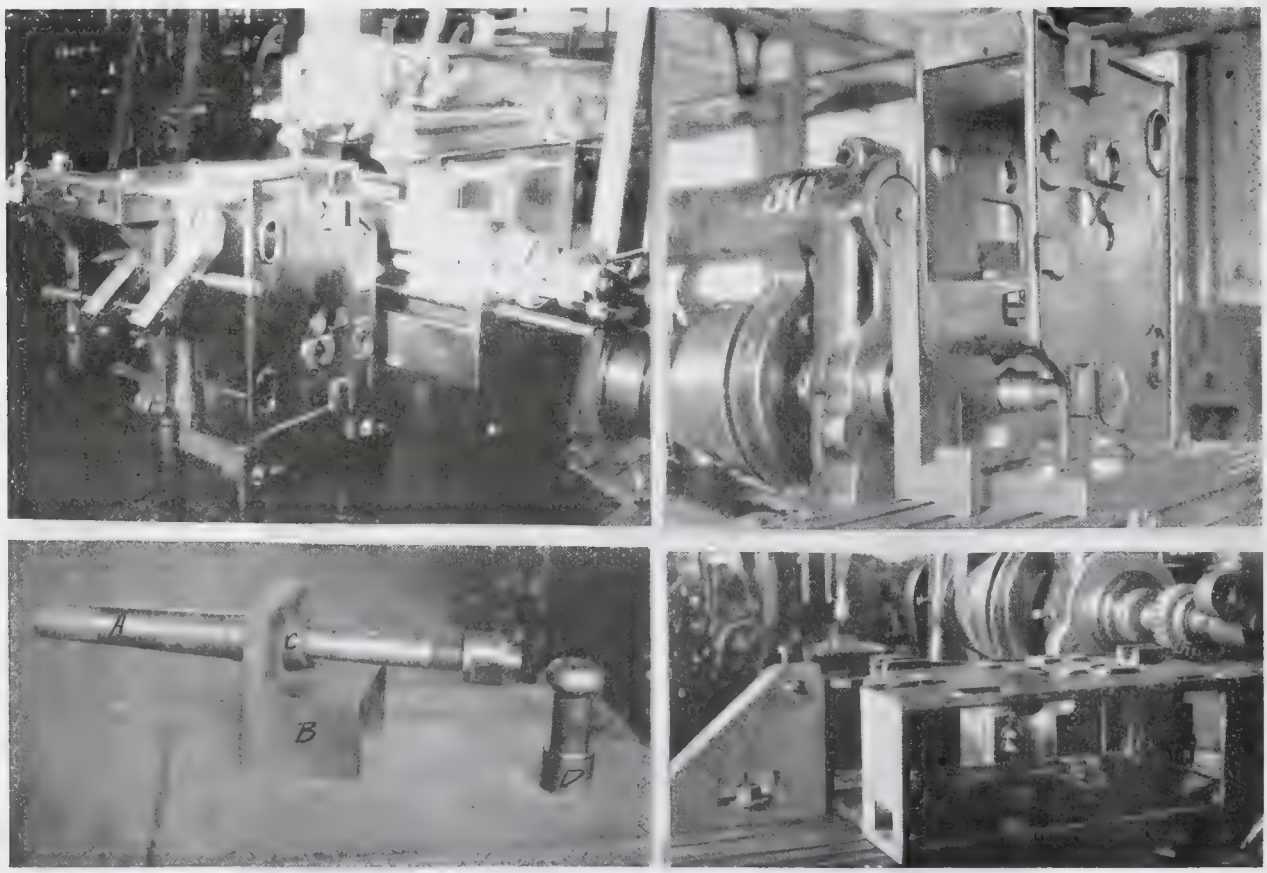
Again, should the jig require any repairs performing on it the entire production on that certain part is at a standstill until these repairs are made.

With a simple plate jig the first cost is low, and if the tools be well designed, using a good locating point, the parts drilled by it are fully as good from an interchangeable viewpoint as the one jig method.

There is also the advantage that a cheaper operator can be used, lower cost for repairs when necessary; but the most important advantage is that should one tool be out of service, the other drilling operations can be carried along, pending the repairs to this particular jig in question.

Drilling the Frame

The illustration, Fig. 7, shows the jig



UPPER LEFT—MACHINING THE TOP SURFACE OF FRAME.
UPPER RIGHT—BORING THE MAIN SHAFT BEARING.
LOWER LEFT—GAUGE AS USED ON BEARING HOLE.
LOWER RIGHT—MILLING SLOT FOR UPRIGHT BAR.

in position for drilling the top of the frame.

The jig is located by a plug, A, which fits into the 2⅜ in. bored hole.

This plug is made integral with the jig proper and the tool is pushed on top of the frame from the rear side.

The jig plate is then pushed over until the sides of the jig and frame casting are in line, as shown by the illustration. Seven No. 5 holes are then drilled in the frame, the drill being guided through the bushings shown in the jig.

The next tool shown in Fig. 8 is used to drill the holes in the bottom of the frame. The jig is located by four plates as A, two on each side.

The wing nuts, B, which are attached to hook bolts, which fit under the flange of the frame casting, are then tightened.

This action forces down the jig against the frame, thus holding it in position.

Four 5-16 in. holes are then drilled in the bottom of the frame, the drill being guided through bushings in the usual manner. The half-tone, Fig. 9, shows the jig in position, ready for drilling the left-hand side of the frame.

The jig is located by means of a plug, A, which fits into the 1⅜ in. bored holes.

The tool is also provided with two rectangular tongues, which fit into the two 1¼ inch sliding bar grooves, the milling of which was described in a previous operation.

The holes on the two sides must be in a certain relation with the bored holes and bar slots, hence the somewhat accurate manner used to locate this jig and the one described next. When the jig has been located as described, it is tapped down until its face rests against the surface of the frame.

The following holes are then machined, the various drills being guided through bushings in the jig to ensure accuracy—six 5-16 in. and 12 No. 19 holes.

The jig used to drill the opposite or right-hand side is shown in our next picture, Fig. 10.

This tool is located by the plug A, which fits into the 2⅜ in. bored hole, and also by a long pin, B, which fits into one of the 5-16 in. holes drilled in the previous operation. Attention might be called to the locating plugs in this and the previous jig.

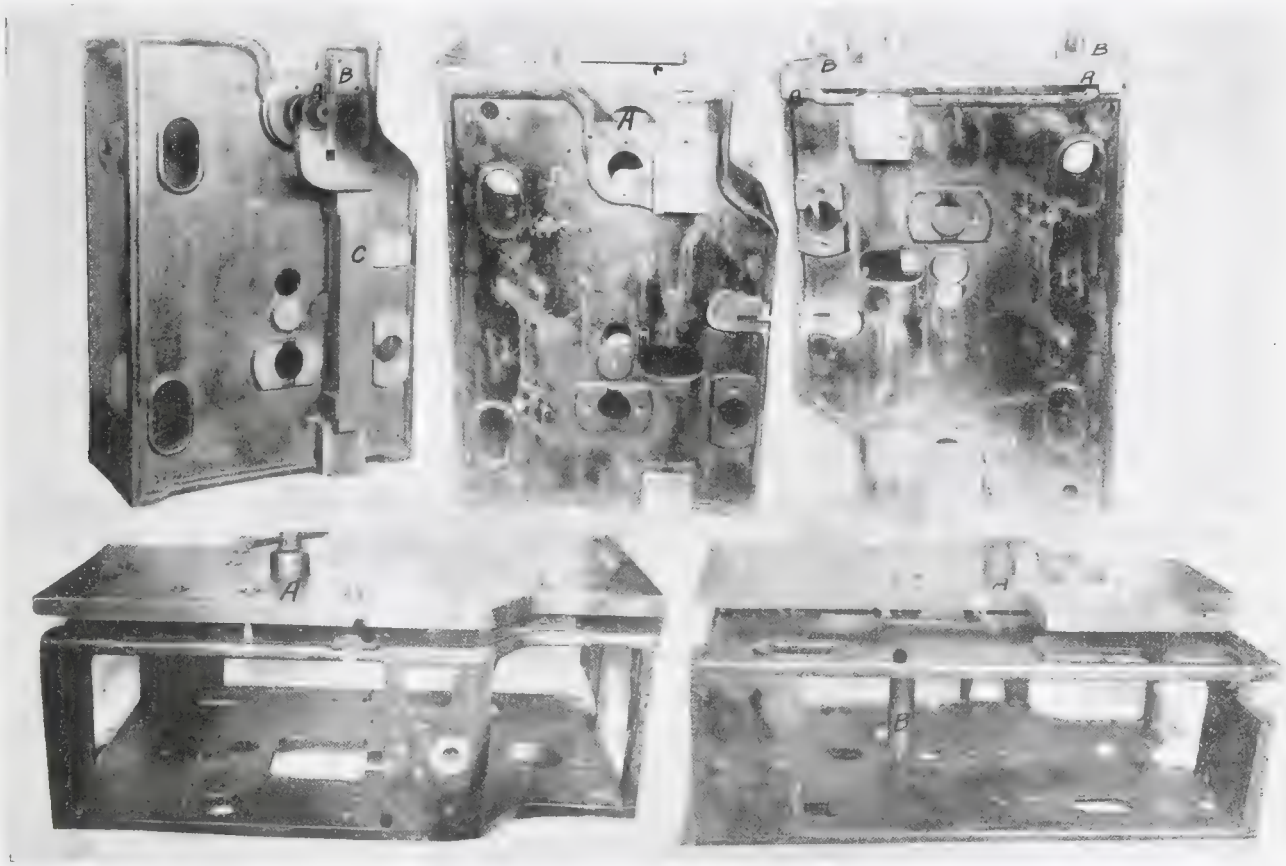
It will be observed that handle is provided on the outer end of these plugs.

This is useful as the locating part of the plug is made a very accurate fit in the bored hole and the operator, by turning the plug by means of the handle, is enabled to assemble or remove the jig, as desired, with greater ease.

When the jig has been tapped down into position onto the surface of the frame, the following holes are machined: Eight 5-16 in., one 31-64 in., eight No. 19, and three ¼ in. holes. Bushings in the jig guide the various drills to ensure the required accuracy.

It will be seen that by using the bored hole and sliding bar slots on the previous jig for a locating medium and on this latter tool the bored hole and one of the already drilled holes, the various holes on the two sides are machined in the correct location with each other. Various holes are then tapped in the frame, no jig being used, the frame being held on the table of a tapping machine.

The frame is afterwards put through a rigid test to see that all holes are in the proper location, the bored holes correct, and also the sliding bar slots in perfect alignment with the bored holes and machined faces. After passing this test the frame is ready for assembling in the hosiery machine and placing into service.



UPPER LEFT—TEST GAUGE FOR FRAME. UPPER CENTRE—DRILL JIG OR TOP OF FRAME.
UPPER RIGHT—ANOTHER DRILL JIG ON FRAME. LOWER LEFT—DRILL JIG FOR LEFT HAND SIDE OF FRAME.
LOWER RIGHT—DRILL JIG FOR RIGHT HAND SIDE OF FRAME.

PAINTING ON BRASS

Shellac or paint will not harden or dry well on brass, and when ordinarily applied usually remain soft and can be rubbed off. Many claim that it is almost impossible to paint on brass in a satisfactory manner, but the following methods have been used: Apply a little varnish and then wash this with a solution of benzine. Another is to apply varnish and then benzol in double the quantity of the varnish, afterward apply the paint, and a week or two later another coat of paint if necessary.

IMPORTANT ANNOUNCEMENT

CANADIAN MACHINERY is pleased to announce that readers have responded splendidly to the challenge of this drawing course. In fact we have received plates from all over the Dominion for entry to the contest, which speaks well for the wide field covered. These drawings submitted have been surprisingly good, and to show readers that we appreciate their efforts, and intend to do all in our power to help them, we make the following announcement:

That every third issue of this series we will return to all contestants their plates, marked and criticized by our editors, who are practical draftsmen as well as designers. Such a procedure cannot do otherwise than help the students, for the criticism will be constructive rather than destructive. Starting with plate No. 4, we will commence returning all plates so far received.

We would like to hear from readers or students as to their opinion of this latest move on the part of our organization to help the reader.

There seems an erroneous impression among some readers that this course is limited to machine tool apprentices only. This is not the case, the only persons barred being graduate draftsmen. Of course the reason for this being obvious. Machinists, apprentices of all kinds, or in fact any readers other than a graduate draftsman, are eligible.

Another point is this, that simply because you did not happen to start in on Plate 1, is no reason why you cannot commence NOW. We wish to have every reader interested in any way, to be a student, sending in their work regularly. Remember, there are three prizes given every issue, and you may be one of the lucky three, so finally let us say that if you have not as yet sent in your work, do so now, for there is no time like the present.

If you have been sending your work along, then keep the good work up, for the very fact that you are working on this course will help you to increase your earning power.

Canadian Machinery Drafting Course—Part IV

In This, the Fourth Portion, We Start in on Six Problems on Geometrical Drawing. This Branch Will Not be Touched on More Than is Absolutely Necessary

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE going into this subject of geometrical drawing let us say that a groundwork on this subject is absolutely necessary, otherwise we would not take it up. We shall, however, confine the work to three plates, so that only the most important geometrical problems will be taken up. By this means the student will not tire of the subject, for the writer of this series knows from personal experience that the average machine shop apprentice hates the very name or look of this subject. Still in due justice to the course these points should be at least touched upon, so students in general must not forget the necessity of getting in this groundwork of three plates, after which a more interesting section will follow though not more important than this the first of the geometrical series. Above all keep up the good work. We are receiving replies galore so keep sending in your work and secure one of the three prizes given each part of this course.

Geometrical Drawing

Geometrical drawing is the art of becoming acquainted with the various lines and figures, what particular properties these figures have, and what bearing they have on mechanical drawing. A working knowledge of the problems to be presented in this course are absolutely necessary to a good draftsman, and are of course supplementary to the main idea, namely, mechanical drawing. As the main idea of geometrical drawing is accuracy, students must be sure to have all their drawings neat and accurate, otherwise the purpose of this section is lost.

In geometrical drawings we speak of definitions, which of course means an explanation of the various lines and figures involved in the study.

Geometrical Definitions

Let us see what these definitions are:

A point is used to mark a position and has neither length, breadth, nor thickness.

A line has length only. It is produced by the motion of a point.

A straight line is one that has the same direction throughout. In other words it is the shortest distance between any two points.

A curved line is one that constantly changes its direction. Sometimes it is termed a curve.

A broken line is one made up of several straight lines.

A horizontal line is one that has the direction of a line drawn upon the surface of water which is at rest. In other words a line parallel to the horizon.

Parallel lines are lines which lie in the same plane, and are equally distant from each other at all points.

A vertical line is one that lies in the direction of a cord suspended from its upper end, having a weight at its lower end. It is a line which is perpendicular to the horizon.

An oblique line is one that neither conforms to the vertical nor horizontal.

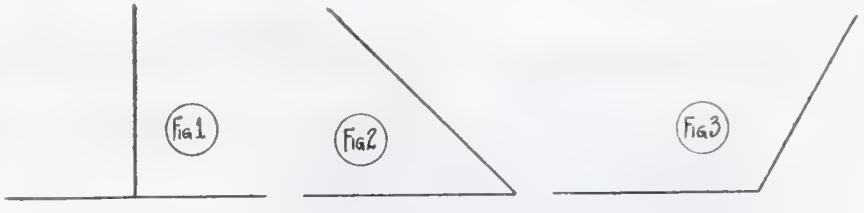
Examples of lines already spoken of are as follows:

Lines drawn with the T-square are all parallel to each other. A line drawn by means of the triangle on its straight side, together with the aid of T-square is a vertical line. A line drawn with the sloped side of triangle with same conditions as above will be an oblique line.

If two lines cut each other they are called intersecting lines, and the point where they cut is called the point of intersection.

An angle is the measure of the difference in direction of two lines. The lines are called sides and the point of meeting the vortex. The size of an angle is independent of the length of the lines.

If one straight line meets another, as



in Fig. 1 so that the two angles thus formed are equal, the lines are termed perpendicular to each other, and the angles formed are known as right angles.

Should the angle be less than a right angle it looks like Fig. 2, and is termed an acute angle.

Should the angle be greater than a right angle it is termed an obtuse angle and appears as shown at Fig. 3.

Before going further into the other various definitions let us consider these already given as sufficient for this first portion on geometrical drawing. In this way the student will not have to carry in his head too many definitions at once, but will be able to concentrate on the particular ones he requires, so now to Fig. No. 4, and the instructions for the completion of the same.

Instructions

As usual commence by making the border lines 9 in. by 13 in., and the trimming lines 9½ in. by 13½ in. Divide this space into the seven parts as shown in the plate. As per usual, place the title, etc., in the lower space, then place problems 1 to 3 consecutively as illustrated. We will explain the working out of each problem as we go along.

Problem No. 1 (To Bisect a Straight Line)

To construct: First draw a straight line AB 3¾ inches long. With A as a centre, and a radius greater than one-half of the length of the line, describe an arc of a circle on each side of this line AB. With B as a centre and the same radius, describe arcs as before, intersecting the first two at the points C and D. Join C and D by the line CD, when the point E, when it intersects AB will be the required point. In other words, AE=EB, as E is the middle point of AB.

This problem could also be termed erecting a perpendicular line to a straight line from its middle point, for the line CD is in the middle of AB and is perpendcular to it.

The next problems Nos. 2 and 3 can be classed under the one heading, namely to erect a perpendicular to a given line from a point in that line. We will take up two cases. First in Problem 2 we will take up the problem when the point is near the centre of the line.

Draw AB 3¾ inches long. Let C be the given point on the line. With C as a centre and any radius, such as CD, describe two short arcs cutting AB at the point D and E. With D and E as centres, and any convenient radius greater than CD, describe two arcs intersecting at F. Draw CF and that line will be perpendicular to AB at the point C.

In Problem 3 we take up a case where the point is near the end of the line.

Draw AB 3¾ inches long. Suppose C about ½ inch from the end of the line as shown. With any point D as a centre and a radius DC, describe an arc cutting AB at C and E. Draw ED and produce it until it intersects the arc at the point F. A line drawn through F and C will be perpendicular to AB at the point C.

Problem 4 (Through a Given Point, to Draw a Straight Line Parallel to a Given Straight Line)

First let AB be the given line 3¾ inches long. Let C be the given point.

With C as a centre and any convenient radius, describe an arc DE intersecting AB at E. With E as a centre, and the same radius, describe the arc CF intersecting AB at F. With E as a centre and a radius equal to the chord of the arc CF, describe an arc intersecting DE at D. A straight line drawn through D and C will be parallel to AB.

Problem 5 (To Bisect a Given Angle Where the Sides Intersect Within the Limits of the Drawing)

To construct. Let ABC be the angle to be bisected.

Draw the sides AB and BC 3¾ inches long. With B as a centre and any convenient radius describe the arc DE intersecting AB at D and BC at E. With D and E as centres, and a radius greater than the chord of half the arc DE, describe two arcs intersecting at F. A line drawn through F and B will bisect the angle. In other words ABF will equal FBC.

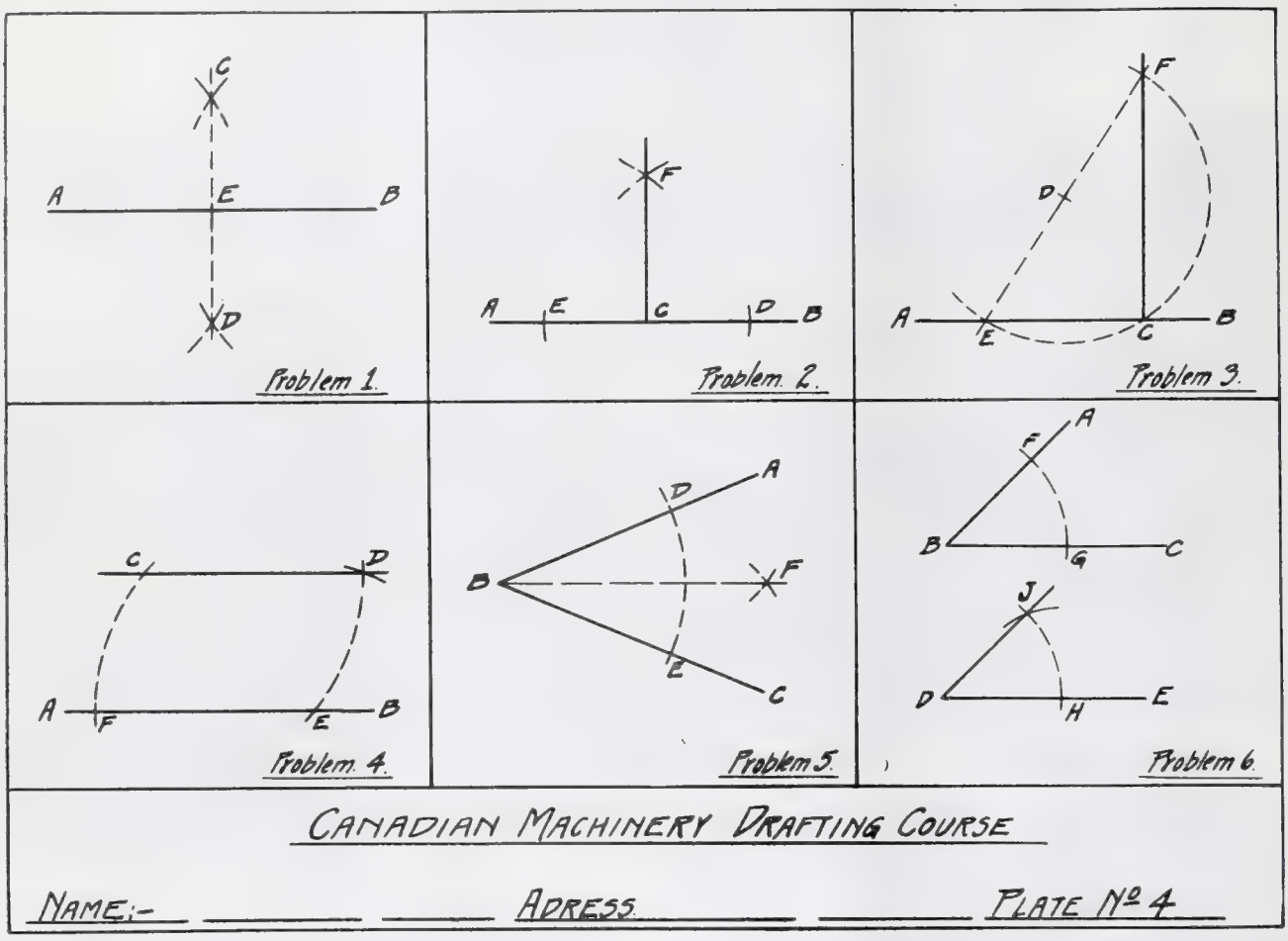
Problem 6 (To Construct an Angle Equal to a Given Angle)

Draw AB 2½ inches long, and the line BC 2½ inches long. The angle formed by these lines may be any convenient size; in this case we will call for 45 degrees. This angle ABC is the given angle.

Now draw DE a horizontal line 2½ inches long, and let D, the left-hand extremity, be the vortex of the angle to be constructed. With B as a centre and any convenient radius, say about 1½ inches, describe the arc FG, cutting both AB and BC. With D as a centre, and the same radius, draw the indefinite arc HJ. Now set the compass so that the distance equals the chord FG. With H as a centre and a radius equal to FG, draw an arc, cutting HJ at J. Through D and J draw a straight line. The angle JDE will now be equal to the angle ABC.

This completes the plate. Draw all these problems very carefully with a 4 or 6H pencil, making sure that the pencil is good and sharp. Draw your lines lightly, then, after completion, ink them in as shown on the plate. Students will do well to study and memorize these problems if possible. Above all get busy with this plate and send us along your work for inspection. Have you landed one of those scales yet? If not, this may be your lucky plate.

NOTE: Owing to some of our students not receiving their copies promptly we have postponed the judging of plate No. 2 for a short time in order to give these parties a fair chance of competing on this plate.



TORONTO.—Mr. W. L. Myers, British Government timber purchaser, accompanied by Sir James Ball, met the Ontario lumbermen at lunch at the National Club recently. That the British Government would be a big purchaser of lumber from Canada for some time to come, was the news received by the lumbermen. They also heard that Britain had purchased lumber to the amount of $30,000,000 already, and that the commissioners would open an office in Montreal to handle all the buying business of their Government. The reasons are

Tear off and send with drawing

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Arranging Trays, Wrench Holders and Pans on Machine Tools

An Article Describing in Detail the Various Type of Pans as Used on Machine Tools, Together With Their Advantages

By F. SCRIBER

THE extensive use of pans, trays, etc., on machine tools calls for consideration of what is best or most adaptable to the particular machine or job in hand. They should be located so as to be most convenient to the operator when he stands in his operative position. They should, of course, not interfere with the manipulation of levers or other operative parts which he has to use. Another thing which should be taken into consideration is keeping them clean, particularly in the case of tool trays. It is certainly bad practice to have a tool tray located where it is apt to become filled with oil or where dirt will accumulate on the tools from other causes.

On milling machines, turret lathes, and such machines it is customary to have one or more pans conveniently located on the machine and it is also quite common to supply floor benches or trays arranged conveniently to the operator. In the case of a lathe, a tool tray is often mounted on the ways of the machine while on the other types of machines the tool pan is combined with travelling parts of the machine such as on tool slides or tables.

In Fig. 1 we have two examples of common types of tool trays and wrench holders. The upper one in this illustration is simply a tray having suitable provisions for holding it on to a machine and a pan effect for holding work or other articles. In the lower illustration provision is made for bolting this wrench holder to the machine and a number of elongated holes are cast in the upper side of it to hold various sizes of wrenches.

Holders similar to these are often found on milling machines, screw machines, etc., and an example of a tray conveniently located at the right hand side of the operator on a turret lathe is illustrated in Fig. 2. This shows a section at the turret end of the machine and the pan or tray is indicated, it being held in position by two screws. A drawing of this pan would show it as being similar to that shown in the upper view of Fig. 1, except that the flange for holding it to the machine is above the pan instead of below. For convenience in mounting these pans on the machine, filing strips are cast on them as shown and indicated in the upper illustration of Fig. 1.

The common type of wooden tray, such as is often used on the ways of a lathe is illustrated in Fig. 3. This tray is free to slide along the ways of the machine and is prevented from slipping sideways by suitable blocks of wood A which fit in the ways. As the tailstock of the machine is moved up to take short work the tray is likewise slid along and thus is always within convenient reach of the operator. Many of these trays are built with shelves above them and some are made with a cabinet effect and drawers.

In at least one instance the writer has noticed that rough cast iron trays have been used for this purpose, which practice is obviously wrong as the rough casting, being slid along the ways of the machine, is sure to scratch it and destroy the accuracy of the ways of the lathe. When cast iron trays are used they should have leather strips, or other soft material should be used where the tray comes in contact with the lathe.

In order to have an oil can always in convenient reach and before the eyes of a machine operator some manufacturers supply their machines with a holder suitable for an oil can. Such a holder is illustrated in Fig. 4, it being located on the base of the machine, and it is believed this illustration is self-explanatory, the bottom of the holder being cast out so oil or dirt will not accumulate therein.

A rather common and convenient arrangement of placing a wrench holder on a small lathe or other small machine is illustrated in Fig. 5. This shows the chip pan of a machine. This pan of course being mounted on suitable legs, the small lathe itself or similar machine stands inside of this pan and at the back as indicated is located a wrench and centre

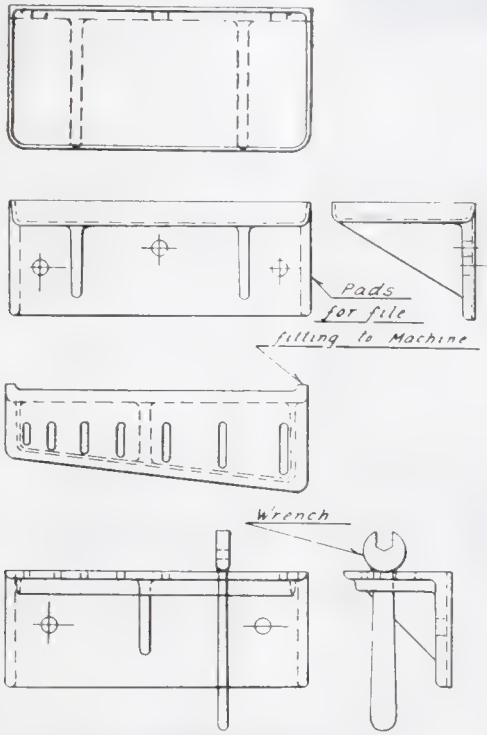


FIG. 1 A COMMON TYPE OF TRAY.

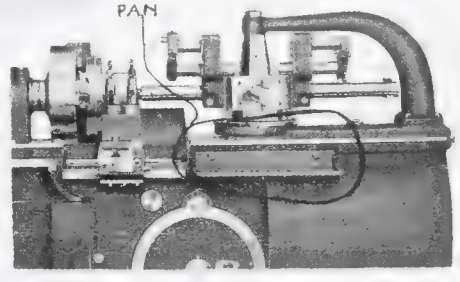


FIG. 2 VIEW OF TURRET LATHE SHOWING PAN IN RELIEF.

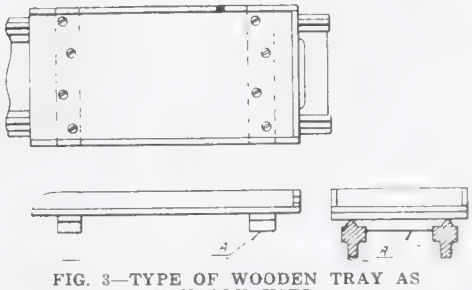


FIG. 3—TYPE OF WOODEN TRAY AS USUALLY USED.

holder, the elongated slots of course being for the wrenches and the round holes being for the centres. Fig. 6 shows a stand of the pedestal type on top of which it is customary to mount a small grinder or machine of similar type. Stands of this type can be conveniently flanged to act as tool trays or pans, this flanging being clearly brought out

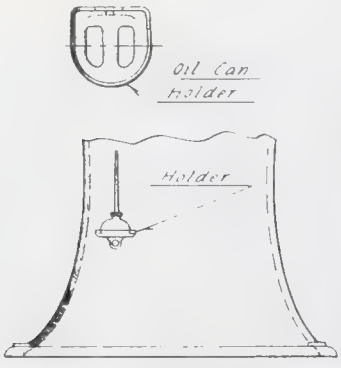


FIG. 4 HANDY TYPE OF OIL CAN HOLDER

by the sectional view AA. Most everyone is familiar with the cupboard for keeping gears, which is provided in many types of machines, and one important feature which one is apt to overlook is indicated at A, Fig. 7, that is to illustrate that the floor inside of the cupboard should slope back so as to hold the box which contains the gears on a

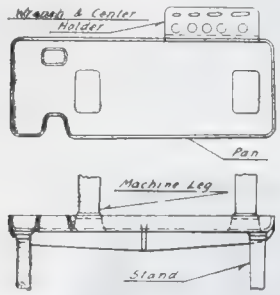


FIG. 5 WRENCH HOLDER FOR SMALL LATHE.

slight angle so they will roll back and will not fall out of the cupboard when the door is opened. In the upper right-hand part of this illustration a wooden box is shown, while the large view at

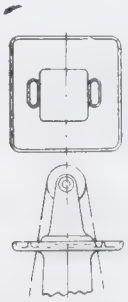


FIG. 6—PEDESTAL TYPE OF STAND.

the left shows how a cupboard appears when arranged in the base of a large lathe. Fig. 8 shows a lathe having six tool holders mounted on the carriage. On this lathe it will be noticed that a flange has been cast around the carriage making it in fact act as a pan. As a convenient means of keeping a milling machine vise or index centres where one will know where they are the shelf shown in Fig. 9 is a good example. This is simply mounted near the base of the milling machine out of the way so that

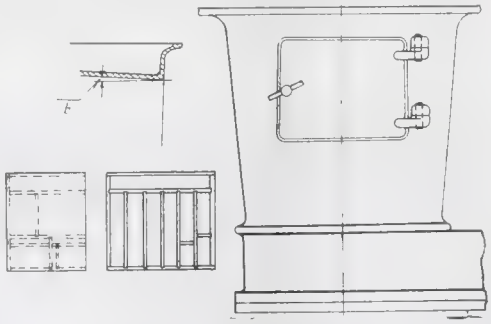


FIG. 7 ILLUSTRATING DIFFERENT STYLES OF CUPBOARDS.

the index centres which go with the machine may be kept thereon when not in use.

An arrangement of a tool tray supported on a pan which is in use on a chucking machine is shown by Fig. 10. In the upper right hand corner of this illustration an end view of this pan is

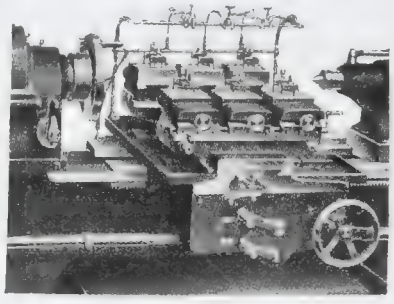


FIG. 8—THE APRON OF A LATHE AS A PAN.

shown; this pan simply has two legs on it notched to go over the edge of the pan, and one bolt is used in the centre to hold it against the top of the machine and to keep it from sliding endwise. This makes a neat and clean arrangement for keeping tools handy on a machine of this type.

In a good many instances it is possible to make the table which holds a small machine a convenient place for keeping parts in process of being machined and the tools for the same convenient. Such an instance is shown in the speed lathe Fig. 11, where it will be noted that the machine (a Brown and Sharpe) is mounted on a stand which is planed on top and has a flange cast around it for catching such dirt as accumulates in handling work suitable for this machine. On the shaper the pan is usually convenient to the operator when he is sitting down, and in the example shown in Fig. 12 the pan is cast with the guard which covers the gears of the machine. This guard of course bolts to the side of the machine and a section through it would appear as shown at the right of this illustration.

It is the little things that show the distinctiveness in machine design, particularly when these things make a more convenient machine for a man to run, and oftentimes prejudice against one type of machine is due to such things as an inconveniently placed handle or other unit of the machine which helps the operator to produce. These little things are items which the operator is familiar with, and if one machine is not as convenient for him as another he will frequently knock it to the disadvantage of the maker.

Fig. 13 shows a small furnace, and a particular feature of this furnace which is apt to appeal to a user is the support A for the soldering iron. This support holds the iron at the most convenient angle where it comes in contact with a good heat and locates it so it will not be floating around where there is no flame.

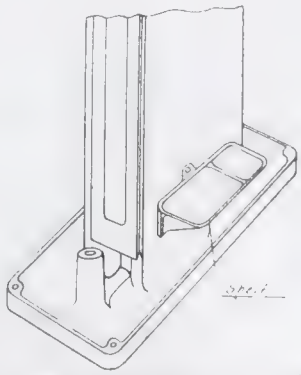


FIG. 9—HANDY SHELF ON MILLING MACHINE.

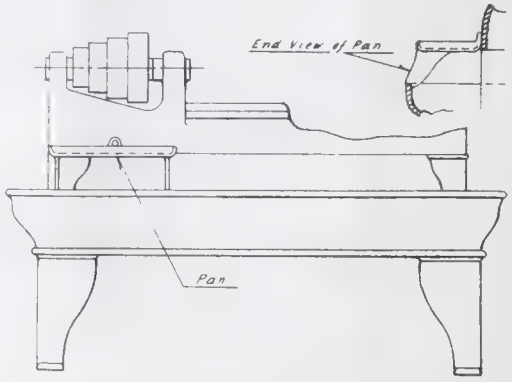


FIG. 10—TOOL TRAY SUPPORTED FROM PAN

By referring to Fig. 14 it will be noticed that two methods of holding wrenches are illustrated, one of which is the plain hook A, which goes through

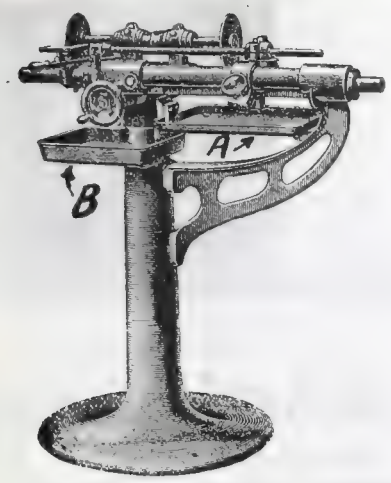


FIG. 11—HAND LATHE WITH CONVENIENT PLACE FOR TOOLS.

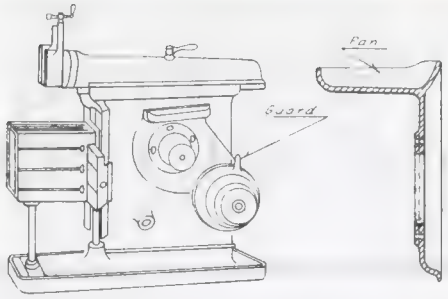


FIG. 12—STYLE OF SHAPER PAN.

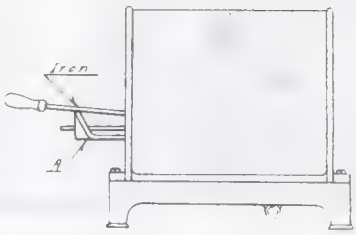


FIG. 13—SMALL FURNACE SUPPORT TRAY

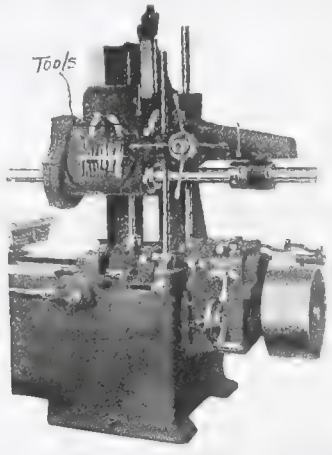


FIG. 17 BORING MILL SHOWING SOCKET HOLDER.

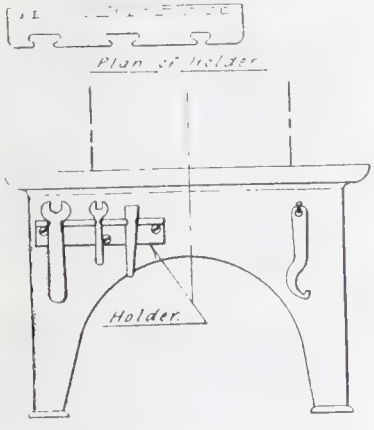


FIG. 14—TWO METHODS OF HOLDING WRENCHES.

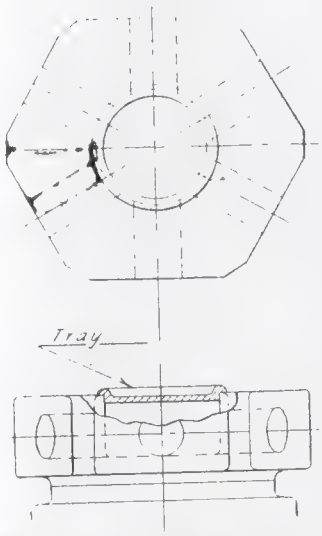
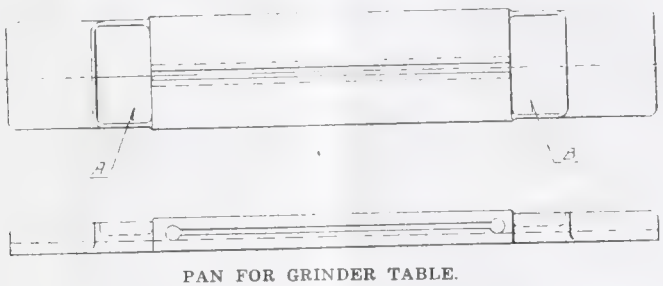


FIG. 15—TRAY CONTAINED IN THE CENTRE OF TURRET.



PAN FOR GRINDER TABLE.

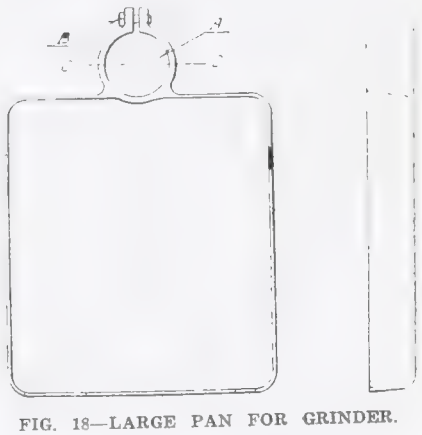


FIG. 18—LARGE PAN FOR GRINDER.

the end of a spanner wrench in this instance. The other means of holding consists of a bracket or holder with slots as shown for holding wrenches or drifts.

Another feature closely allied to the hook for holding a wrench is a chain to prevent the wrench from being taken away from the machine, this being attached to a hole in the wrench. Another feature found on some lathes is a recess in the tailstock which forms a good place to keep a few odds and ends handy.

A tray contained in the centre of a turret is illustrated by Fig. 15, and this also acts as a guard to keep chips out of this hole. This pan is made quite shallow and is flanged to fit the hole and is particularly suitable for holding an extra supply of cutters for the boring bars generally used on a turret lathe or chucking machine.

Whether the table of a grinding machine had pockets designed to be cast into it for the purpose of catching dust, water or to act as a convenient place to lay a bolt or wrench, it is hard to say, but whenever the table of a grinder has pockets such as shown at A and M, Fig. 16, these are quite generally used for keeping tools handy.

Fig. 17 illustrates the head end of a horizontal boring machine and shows how tools are kept handy by holding them in a bracket on the sliding head, such tools as wrenches, drifts and taper sockets being held thereon.

(To be continued)

SURFACE - HARDENING COPPER AND BRONZE

The hardest cupro-tin alloy is composed of 73 per cent. copper and 27 per cent. tin, and where this is obtained on a copper soldering bolt which has been "burnt" it takes a good file and much labor to remove the hard metal. By purposely adopting the same method of surface alloying, a similar hardness can be secured, and the surface of copper and bronze made practically proof against filing. The copper or tin alloy is kept at a full red heat under a coating of tin for some time, the surface forming an alloy of the maximum hardness, although care is necessary not to overdo the matter.



WELDING AND CUTTING



A Review of Some Modern Methods of Arc Welding

The Author in a Paper Read Before the Institute of Mechanical Engineers, London, Makes Interesting Comparisons of Various Systems

By THOMAS H. HEATON

A MORE recent development of the Thomson system of resistance or contact welding is made by machines adapted to more or less special purposes. There are two varieties of operation, spot welding and roller welding. The principle is the same in both. The work is placed between electrodes of pure copper and current is passed through it causing heat at the point of contact while pressure is applied to the work closing the joint and completing the weld. The current is supplied to the primary winding of a transformer placed within the machine. The secondary portion of the transformer consists of that portion of the machine that does the work and terminates in the electrodes. The current varies according to the speed and the thickness of the work. In thin work of, say, 20 B.G. the voltage at the electrodes may be ½ to 1 volt, and the current, say, 80 amperes. The current is again alternating and of single phase.

The current, the pressure of the electrodes upon the work, and the speed of operation must be carefully adjusted each in relation to the others. With mild steel 20 B.G. thick perfect welds may be made at a speed of about eight seconds to the lineal foot between rollers. Where rollers cannot be applied the welds are made by a series of spots. If the spots overlap tight joints are made. Where tightness is not essential the spots may be applied at intervals. The welds are very strong and sound, and probably the metal is left in a better condition with this than with any other system of electric welding.

The best work is produced when the machines are regulated automatically. That is to say, where the time during which the electrodes are impressed upon the work does not depend upon the workman but upon the machine. The author is referring here more particularly to spot-welding. In roller welding the feed must be automatic.

Some spot welding machines are so arranged that the workman regulates the time during which the current passes by means of a treadle. He may allow the electrodes to be in operation too short a time, and so fail to heat the metal sufficiently to make a weld, or he may keep them in operation too long and burn or melt the metal. An automatic release regulating the time is obviously preferable. Machines used by the author are for welding thin sheet metal from 24 B.G. to, say, 14 B.G. Machines have, however, been made for dealing with far greater thickness, such as ½-inch to ¾-inch where welded spots take the place of rivets, saving time and labor. It is conceivable, however, that this system has its limits, especially where rollers are used, owing to the disintegrating effect upon them of the heat due to large currents; although the electrodes are in all cases hollow and cooled with water. So far as the author is aware, this system is chiefly applied at present to thin metal.

To weld successfully and to produce the best results so far as the metal at the weld is concerned, the metal to be welded must be suitable. The author refers more particularly to mild steel. It should be made by the open-hearth process, sound, of regular thickness, and low in carbon, sulphur and phosphorus. Otherwise it may be difficult to weld or the weld when made may be brittle. More especially in resistance welding of thin steel the metal must be clean and free from scale. Too much phosphorus tends to make the steel brittle when cold, too much sulphur tends to prevent welding and to hot shortness. Too much carbon prevents welding.

The author has found that for welding it is best to keep the carbon content below 0.1 per cent. and sulphur not above 0.05 per cent. Recently the author found that open-hearth sheet steel of the following analysis in thin sheets would not weld by the resistance method:

	Per cent		Per cent
Carbon	0.19	Sulphur	0.097
Silicon	0.05	Phosphorus ..	0.075
Manganese	0.44		

Whereas the following welded satisfactorily:

	Per cent		Per cent
Carbon	0.09	Sulphur	0.072
Silicon	0.05	Phosphorus ..	0.159
Manganese	0.38		

It is to be noted that the sulphur content is high, especially in the former. Both these steels worked and flanged well, although in the latter the phosphorus is high. With the arc systems the need for extreme cleanliness is not so great, as they are not so sensitive, but

Results of Experiments to Ascertain the Tensile Strength, etc., of one piece of Iron Bar, Electrically Welded in the presence of Mr. W. G. Kirkaldy, at Messrs. J. W. & T. Connolly's Works, King's Cross.

Test No.	Description	Original Size.	Original Area.	Ultimate Stress—Total.	Ultimate Stress—Per sq. in. of Original Area.	Ratio of Weld to Solid.	Contraction of Area at Fracture.	Extension In 2 ins.	Extension In 3 ins.	Extension In 4 ins.	Appearance of Fracture.		
		in.	sq. in.	lb.	lb.	tons.	%	%	%	%	%		
4498	(Bar 1⅝-in.) (× ½-in.)	(1.22) (×) (0.485)	0.592	34,128	57,649	25.7	–	–	36.7	31.0	24.0	21.5	Fibrous
4499	(Bar 1⅝-in.× ½-in. Weld) (midlength)	(1.22) (×) (0.445)	0.543	27,520	50,681	22.6	87.9	12.3	8.0	7.0	6.2	Broke at weld Fibrous	

to a certain extent the same conditions apply.

In heavier material welded by the Benardos arc, mild steel of the following analysis welded well:

A			
	Per cent		Per cent
Carbon	0.10	Sulphur	0 044
Manganese	0.45	Phosphorus ..	0 054

whereas mild steel of the two following analyses would not weld satisfactorily:

	B	C
	Per cent.	Per cent.
Carbon	0.15	0.10
Manganese	0.52	0.40
Sulphur	0.093	0.086
Phosphorus	0.141	0.073

(The silicon content was not given in these analyses.)

On the other hand good welds were made of mild steel constituted as follows:

D			
	Per cent.		Per cent.
Carbon	0.15	Sulphur	0.025
Silicon	0.009	Phosphorus ..	0.068
Manganese	0.64		

Thus, although the carbon is high, it does not account for the fact that sample B would not weld well. The failure therefore must be due to other constituents. Probably the chief cause was the high percentage of sulphur. Where sulphur is high it seems to cause boiling of the metal, which after cooling is full of the craters of burst blisters. The great heat of the arc and the freedom of fusing enable this phenomenon to manifest itself.

The author particularly desires to draw attention to this question of quality, which has not hitherto received the general attention it deserves. He is of opinion that careful scientific investigation of the effect of each of the constituents of ordinary mild steel would be of considerable value.

There are special hard steels made, however, which will weld, and mild steel can be welded to them. For example, certain tool-steels can be welded to mild steel shanks. In some cases these welds can be made by a blacksmith, but resistance welding-machines are made for effecting these welds electrically. They require very careful regulation of current and steel of suitable quality. The author has seen most effective welds of high-speed tool-steel to mild steel made in such a way that only the cutting edges of the tools are of the high-speed quality.

Different kinds of high-speed steel require various methods of treatment, and to make successful welds requires some experience of the steel in order to regulate the welding temperature. The temperature appears to be a matter of the greatest importance to enable such welds to be effectively made. In some cases it is found that the high-speed steel heats much more quickly than the mild steel to which it is being welded, and some high-speed steel heats much more quickly than others. In welding this steel the current is applied until the high-speed steel reaches a red heat, and is then cut off to enable the heat to be communicated to the mild steel. The switch for turning the current on and off is manipulated accordingly, the current being continually started and stopped as the operator watches the heating effect. As the steels become softened by the heat, pressure is gradually increased squeezing the two steels together.

There is of necessity a good deal of sparking at the switch during the operation, but the economy effected by using a small quantity of the comparatively clear high-speed steel for the cutting portion of the tool as compared with the larger quantity of mild steel in the shank is very considerable. It is scarcely possible to obtain analyses of the various high-speed steels, but among others the high-speed steel known as Stellite is effectively welded in this way.

Testing

It is the author's opinion that an efficient system of testing should be applied as far as possible to all welds. Nothing goes out of the author's works that is not tested. The tests should be designed in relation to the welds made and the purpose they are required to fulfil, and should be as thorough as possible without over-straining the material. A good test for metal not subjected to pressure is to hammer the welds when cold to break superficial skin welds, and then to apply petroleum to the weld. Petroleum is very penetrating and will come through a defect quickly as a rule. It also has the advantage of showing clearly by a black spot or stain exactly where the defect is.

For vessels subject to internal pressures, it is best to apply either a test with compressed air for low pressures, say, up to 20 lb. per square inch, or a hydraulic pressure test for higher pressures. A high-pressure test with compressed air is dangerous and should not be used, or if used should be applied only by skilled operators under strict conditions. A slight air-pressure may indicate defects either by dipping in water, in which case bubbles appear, or by applying a soap solution to the surface so that defects are indicated by soap bubbles.

There are certain welds, however, that cannot be very easily tested. For example, the hull of a ship is a very modern application of electric welding. Pressure cannot be applied. The petroleum test cannot be applied unless the joints are so made as to be suitable for such a test. The author is inclined to think that in such a case V joints should be carefully prepared, and the welds made by the Quasi-Arc process if electric welds are desired. Petroleum could then be dabbed on to the inside of the plates at the welds and defects would be indicated and could be remedied. Before applying the petroleum the welds should be smartly hammered to break superficial skin welds, more especially for thicker plates. With lapped joints it would not be possible to apply such a test effectively. It is probable that this kind of weld would be better than a hammered weld. It would be difficult to hammer properly such a weld, and as hammering tends to draw the metal somewhat an attempt at hammering might lead to distortion and irregularity of the surfaces at and near the joints.

The stresses upon the hull of a ship, however, are so varied and so incalculable that a petroleum test alone would, in the author's opinion, not be adequate. To make dependable welds in such a case demands the highest skill in the welders, whose reliability should be proved by tests upon selected welds of a similar nature. The welding of ships has been discussed within recent months, and it is an open secret that experiments have been and are being made. It is claimed and appears clear that there would be a considerable saving in labor and a consequent increase in the speed of ship production. It should not be overlooked that, provided really good welds can be ensured, they are stronger than the best riveted joints and are tight. The question of welding the hulls of ships is a very serious one, and while the author would encourage experiment and research with confidence, he would at the same time advise caution in such a matter.

In testing welds there are, of course, the well-known methods of testing for tensile strength, for elongation, for hardness, etc. A good electric weld should have fully 90 per cent. of the strength of the original metal. These tests, however, do not fulfil all needs in such cases as, for example, the hull of a ship subjected to complicated stresses.

In considering ordinary tensile and elongation tests as applied to welds, it is clear that their results may be misleading. First, the Benardos arc is the only electrical arc system that produces a true weld. The systems using a metallic electrode are more in the nature of soldering, inasmuch as they unite the parts to be welded by means of a substance differing very often from those parts. As a criterion of the relative strength of the original metal and the weld, it is obvious that the comparison is scarcely a true one.

Secondly, elongation is again scarcely to be considered a true test, because at the actual point of union the nature of the added metal is not the same very often as that of the original.

Mr. Strohmenger has designed apparatus to test in other ways. In one case he has made a machine to test by alternating torsional stresses. A test-piece is inserted in the machine and gripped at each end in a vice. One vice is stationary and the other movable. The movable vice has a rocking motion so that the test-piece is subjected to torsional stresses of 20° (10° on each side of the centre line) and is turned backward and forward until it fractures. The weld would in such a test-piece be in the centre lengthwise. It is found that in good mild steel a piece about 18 inches between the jaws and without a weld in it will withstand about 250,000 twists be-

fore fracture. A good weld should approach 90 per cent. of this figure in material suitable for welding.

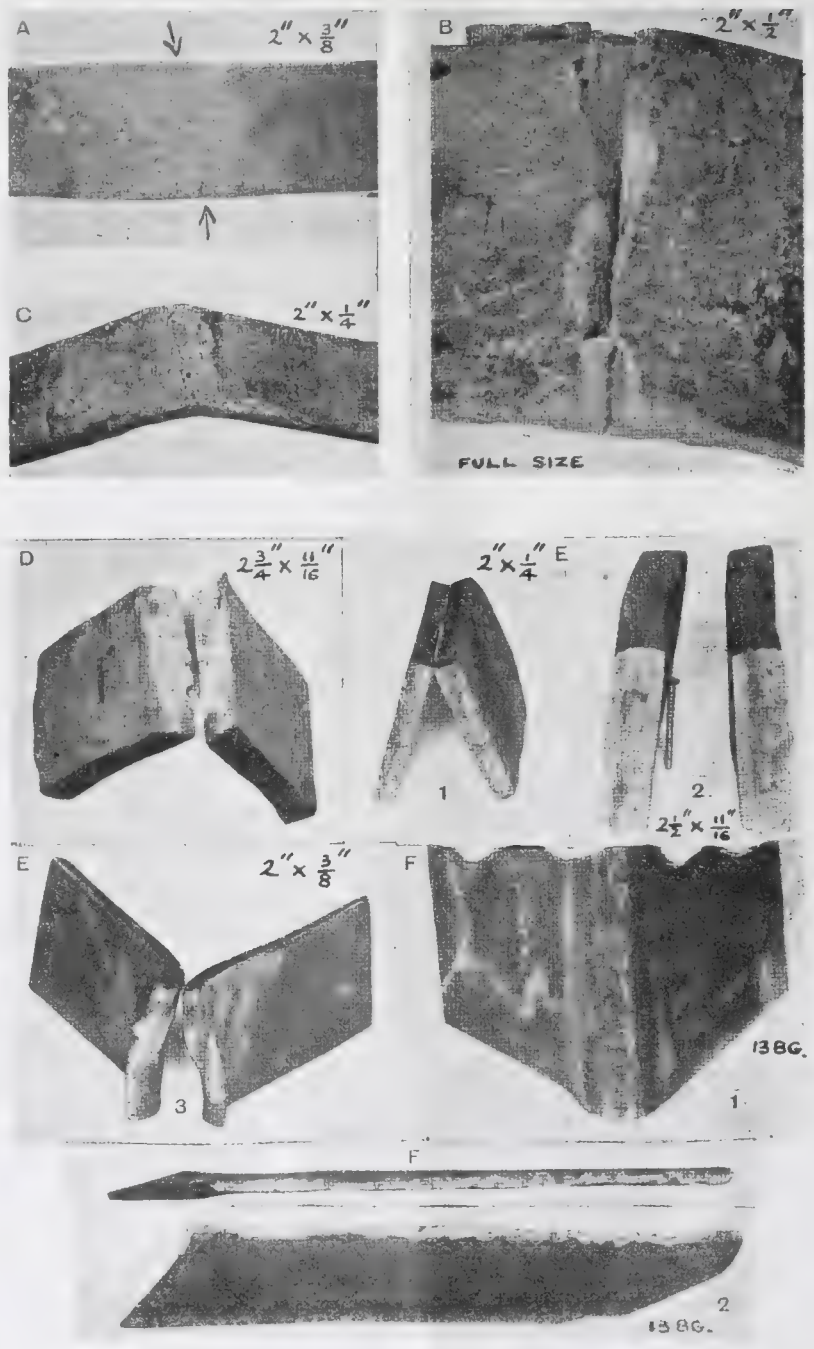
Mr. Strohmenger has made another testing machine for combining an impact with a bending test in rapid alternations. It appears to the author that these methods of testing are worthy of consideration. Adequate tests of reliability and good quality seem to be especially necessary in view of the recent development of welding. All kinds of people have been called upon to make welds. Very few are capable of making reliable welds of varied character. Often the best looking welds are the worst welds through being superficial. The old adage, "beauty is but skin deep," is very applicable to welds.

A very remarkable test of the metal composing the welds has recently been made, involving a disturbance of the structure to an extent which the author would have expected the welds would not resist. A number of mild steel cylinders, each about 1 foot long by 10 inches outside diameter of open-hearth mild steel of 26 tons per square inch ultimate tensile strength ⅜ inch thick, were welded longitudinally. These were reduced by means of dies in a hydraulic press at one end to about 4½ inches outside diameter. The cylinders were reduced in three heats, the first reduction being 4 inches in diameter, the most severe of the three. These were welded by means of the Benardos electric arc with carbon electrode, and so long as the welds were properly made they withstood the operations successfully. Welds made with a metallic electrode did not stand, they broke early in the first pressing and overlapped in the dies.

Welds made by oxy-acetylene gas did not break, but the soft iron joint squeezed out so that the dies would not quite close, and the length of the finished article did not come out so great as was desired. The length had to be increased by building up with oxy-acetylene.

In addition to the varieties of work referred to, electricity is being used for cast-iron, for aluminium and other metals. Even pure nickel has been spot-welded. There is not room within the limits of such a paper as this to do more than mention them. Where electricity is used for welding cast-iron it is in most cases employed with a metallic electrode. Both the Kjellberg and the Quasi-Arc processes are used in this connection. The author understands that in America the Slavianoff process has been used with considerable success, notably in the repairs to the cylinders, etc., of the engines of the German ships "Vaterland" and others that were requisitioned by the United States Government.

Where electric welds were made, mild steel was first deposited on the cast-iron surfaces, and the final joint made by welding the mild steel parts together. In this case there was no pre-heating. It is interesting to recall that, as far back as 1891, metallic electrodes were used of ordinary grey cast-iron by Messrs. Lloyd and Lloyd, at Halesowen. A number of repairs were effected, notably a fly-wheel which had broken in the arms and which was welded in situ. Fires were lit round the wheel to heat it before welding, and it was welded while at a red heat.



The author would like to acknowledge with thanks information about systems of electric welding in which they are interested supplied by the following gentlemen and firms, who have kindly furnished illustrations, samples of welded articles, or have allowed the author to see their works in operation, namely, Mr. Longley, of Messrs. Smith, Parfrey and Co., Ltd.; Mr. T. F. Tate, of the Electric Welding Co., Ltd.; Mr. Rokes, of the Telegraph Construction and Maintenance Co., Ltd.; Mr. Strohmenger, of The Quasi-Arc Co., Ltd.; Mr. H. S. Marquand and Mr. Kennedy, of The British Arc Welding Co., Ltd.; Mr. Devey and Mr. Millinger of The British Insulated and Helsby Cables, Ltd.; Mr. Burfitt of The Associated Equipment Co., Ltd.; Walthamstow; The Haslam Foundry and Engineering Co., Ltd., Derby; Mr. Green of Eliza Tinsley & Sons, Old Hill; Mr. Meacher of the Westminster Engineering Co., Ltd.

The Vapor Car Heating Company of Canada has been formed, with a capital of $120,000, divided into 2,400 shares of no nominal or par value and 1,100 shares of preferred stock of one hundred dollars each. The chief place of business is Montreal, and the company will manufacture heating and ventilating apparatus for railway cars, steamships, buildings, etc.

The Adaptability of Oil Fuel to Industrial Purposes

In 1917 the largest quantity of oil fuel used for furnace purposes was for heating billets in connection with the manufacture of shells, while in pre-war times the principal consumers were glass bottle manufacturers and makers of rivets, bolts and nuts. For forging or drop stamping wrought-iron materials the metal must be heated up to about 2,500 deg. F. This temperature was formerly obtained by placing iron bars in a coke furnace of the type used by the wayside smith, though of improved construction and larger dimensions. Till gas and oil fuel were introduced the process was rather a slow one, but since oil has been used in an intelligent manner the output of each new or converted furnace has been trebled. Further the size of the furnace is reduced by 30 per cent. The working area occupied by a furnace and its adjacent machines is only about 50 per cent., more area has to be occupied by a stack of coal and behind it by the resultant ashes. With oil fuel these spaces can be used as furnace pitches.

In recent years many metal-melting manufacturers have either scrapped their coke-fired furnaces or converted them to gas or oil. Of these two gas is probably to be preferred, except that its calorific value in any town may vary hourly while that of oil is constant. The principal metals melted at present are aluminium and 70/30 brass. The former is usually melted in "lift out" crucibles, the melted metal being carried to the moulds, whereas brass is melted in tilting furnaces, to which the moulds are brought. For liftout furnaces melting low fusion metals the average oil-fuel consumption is about 15 per cent., and for tilting furnaces about 10 per cent. of the metal melted; that is, for every 100 pounds of metal melted the former would consume about 1½ gallons and the latter 1 gallon.

In the early years of this century a French engineer took up the case of oil as an auxiliary to coal. Several evaporative trials were made with the boiler of a French Navy ship burning coal alone at the rate of 18.8 lb. per sq. ft. of grate per hour and burning coal and oil in different proportions at the rate of 21.3 and 21.7 lb. of mixed fuel per sq. ft. When a mixture containing 45 per cent. of petroleum was burned the evaporation showed an increase of 25 per cent. over that with coal only, and when the proportion of petroleum was 64 per cent. there was an evaporative increase of 56 per cent.

About four years ago power-station engineers began to take an interest in the subject, on the theory that in conjunction with oil fuel a poorer class of coal could be used than could be burnt satisfactorily under the boilers. Poor coals tend to cake on the links of the chain grate stokers, preventing the quantity of the air necessary for complete combustion from being drawn in; hence a smouldering mass travels along the bars and is dumped into the ashpit only partly consumed. But with oil fuel the argument was that, owing to the almost perfect combustion obtained, the combustible gases rising from the coal fuel bed would be quickly ignited and would cause the mass to become much more incandescent, thereby tending to aerate the bottom mass, which would then allow sufficient air to be drawn through to complete the combustion of the rest of the poor coal. Tests were carried out under a coal-fired Stirling water-tube boiler. One burner was placed on each side, about 25 per cent. from the back of the grate, and oil gravitated from an overhead tank to the burners, which were of the Kermode steam-jet type, working with steam at 25 lb. pressure. In the first test a nutty slack having a calorific value of 10,400 B.T.U. was employed, and a boiler efficiency of 69.25 per cent. was obtained; the temperature of the combustion chamber was 2,648 deg. F., and of the uptake 660 deg. The last of the tests was carried out with a nutty slack of 10,300 B.T.U., and Mexican fuel oil of 18,750 B.T.U., the proportion of oil to coal being 8 per cent. on a B.T.U. basis and 4.96 per cent. on a weight basis. A boiler efficiency of 74 per cent. was obtained, and the temperature of the combustion chamber was 2,850 deg., and of the uptake 628. With coal at 20s. 10d. a ton and oil at 50s. a ton, the cost of a ton of water evaporated with coal only was 2.8s. as against 2.62s. with coal and oil, the money saving with the latter thus being 6 per cent.

CASITNG STRESSES IN IRON CASTINGS AND THEIR RELEASE

An iron casting, when left unmachined, will move somewhat in the course of a few months, but will then remain steady until the skin is removed, when again the whole or partial removal of the outer parts will again cause the metal to move and a period of usually some months will be necessary to again secure steadiness. All cast metals in the state in which they leave the moulds are in a state of internal stress until this has been removed by annealing, or some other method of treatment, but it is iron which is now being dealt with in the form of ordinary grey castings—not what are termed amalleable cast iron, which is a special production—and in the ordinary course, as these castings leave the moulds, they are subject to internal alterations of the stresses set upon casting, which causes the casting to move, or "warp," as it is more usually termed.

In the ordinary way, if you plane off or otherwise remove the outer skin of an iron casting, and store it away on edge for from six to three months, according to its shape and size, afterwards finishing the mechanical work and giving a further short period of rest, you secure that the release of the stresses is such that future movement is practically non-existent; but this takes time, and unless time is an unimportant matter, this form of treatment becomes commercially impossible, and must either be used in combination with heat treatment, or the heat treatment must alone be relied upon.

In what is called "annealing" grey iron castings, considerable heat has to be gradually applied and held for an hour or so, and then gradual cooling must take place, the castings being cold at the start. No great change takes place in the hardness of the castings, the annealing not having the same effect as on a steel casting, which, with careful packing, can be softened very considerably, but certain small changes take place in the iron, and probably a little carbon is absorbed by the skin at certain temperatures. Probable the best method of working is to pack small castings in open flasks with chips, such as are produced by a mortising machine, mixed with a little sawdust, and to place these in a muffle or furnace, the heat being gradually raised to about 900 deg. Cent., and held there for a time, and then gradually cool off, the whole process being completed in under twelve hours. Larger castings could be placed on a bed of chips in the muffle or furnace and have chips well packed amongst them, being careful not to pack too closely, and the heat applied, the heavier articles taking possibly double the time as the small ones. The muffle may be a rough-and-ready one, a piece of a 3 ft. boiler smokestack doing very well, if the ends are roughly blocked up with dry bricks, as the smoke and gases must escape to prevent the pressure bursting some part of the oven or muffle.

After cooling, the castings should be brushed off clean and machined, if necessary; a second heating, perhaps, then being given to ensure that any unequal stress caused by the machine is set free.

Castings made from wrought iron or mild steel should be packed in ore and heated to nearly 1,200 deg. Cent., for some hours to cause the change of structure necessary to secure amalleability, the length of time depending largely on the bulk of the articles. The treatment of these castings must vary with the content of the metal, and no hard-and-fast lines of working can be laid down. For instance, it is possible to make wrought iron castings which can be bent cold to an angle of more than 90 deg. in the state in which they leave the moulds, and in such cases annealing is scarcely ever wanted, but low grade castings would have to be annealed to get the same malleability. This work, unlike the heat treatment of the grey iron castings, is really annealing, and requires the supervision of skilled workers, quite different to that given to the heating and cooling of the grey iron.



WHAT OUR READERS THINK AND DO



Removing and Replacing Ceiling Motor Armatures

A Handy Rigging Which Enabled Heavy Armatures to be Handled With a Minimum of Labor and Time—Two Pair of Chain Blocks and Small Buggy the Means

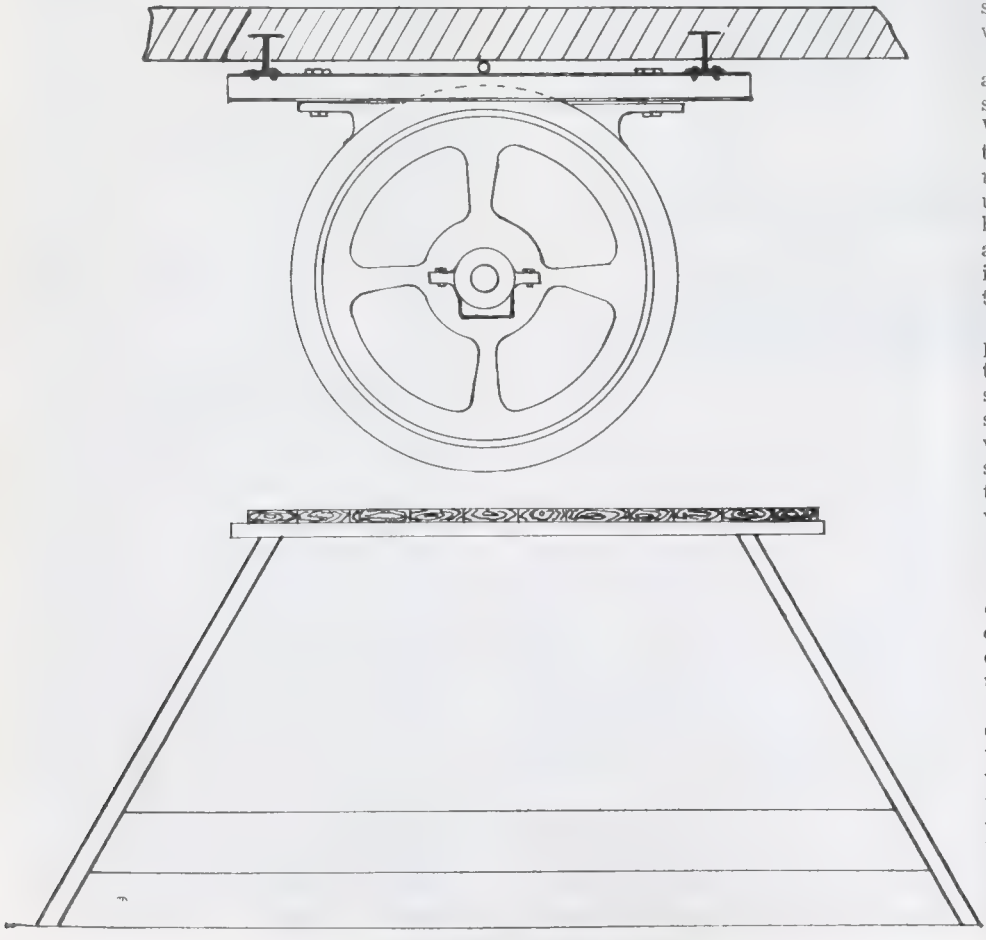
By T. H. FENNER, Associate Editor

IN manufacturing plants where the motors are suspended from the ceilings it is often necessary to remove an armature for repair and replace it by a spare one. The ease with which this work can be done depends on the familiarity of the millwright's crew with the job, and the gear available.

Direct-current motors of medium speeds and power have armatures weighing up to twelve hundred pounds, and require careful handling if they are to be moved without damage to men or property. This is especially the case where they are suspended from ten to fifteen feet in the air.

In one plant the writer has in mind a very good system had been evolved for doing this kind of work speedily and safely. The ceiling motors were about forty-five in number, running all the way from 1½ h.p. to 75 h.p., but the majority were 35 and 75 h.p.

Spare armatures were kept, and the rule was to remove an armature whenever it gave signs of becoming troublesome and replacing it with a spare. Sometimes of course an armature would burn out through various causes during the working hours. This would mean a certain number of machines being stopped, and in this case speedy replacement was a necessity.



SIDE VIEW OF THE MOTOR.

The motors were fastened to channel irons, which were in turn fastened to the I beams of the concrete floor above. These beams were made heavier than the ordinary floor beams in view of the extra weight. The line shaft was direct coupled to the motor shaft in most cases, and in some instances, where one motor drove two adjacent departments, each end of the motor shaft drove a line shaft. This of course made more work when an armature was to be removed.

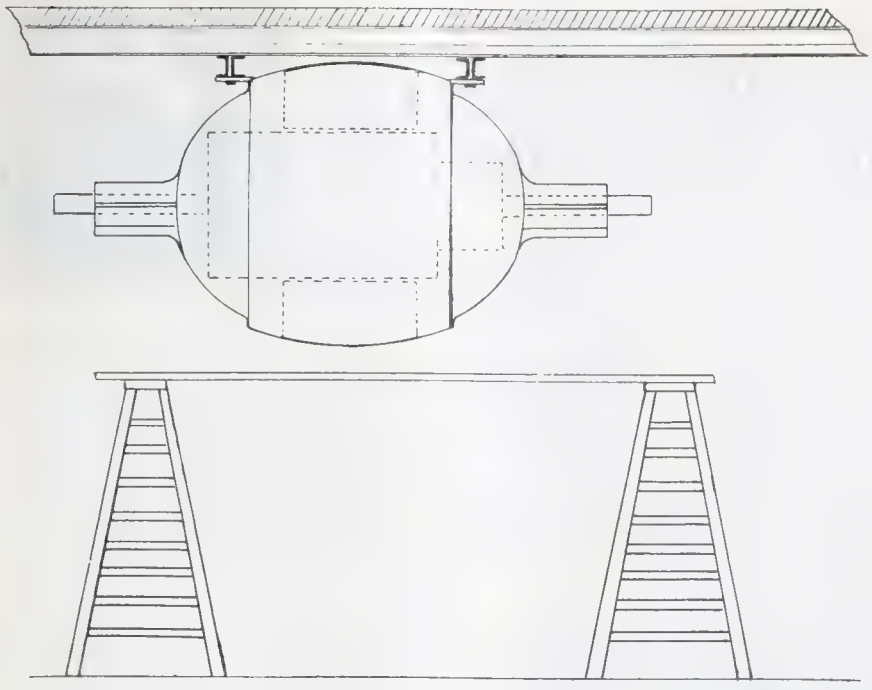
The hangers for the line shafts were about fifteen feet apart, the length of shafting being about seventeen feet. Where a heavy pulley was installed between the motor coupling and the first regular hanger, extra hangers would be used to take the weight of pulley and belt pull. The hangers were of the self-aligning type, and were bolted to three-inch wooden stringers, which were in turn fastened to the floor I beams.

In the millwright's store was kept a pair of strong, high trestles and enough two and three-inch planking to make a strong working platform. A supply of square blocking was also on hand and was kept for this particular work. A strong four-wheeled truck for moving the armatures from and to their place was also kept here.

The Method of Procedure

The best way to describe the method employed is to follow the course of events from the time of receiving word of a burn-out till the repair is made and the motor running again.

The first step would of course be an examination by the electrician, and he would decide whether he could effect temporary repairs, or if the armature would have to be removed. If this was the case work would start immediately. While the electrician and his helper would disconnect the leads and remove the brushes from the commutator, the millwright's gang would hustle over their trestles, chain blocks, slings, etc.



FRONT VIEW OF THE MOTOR.

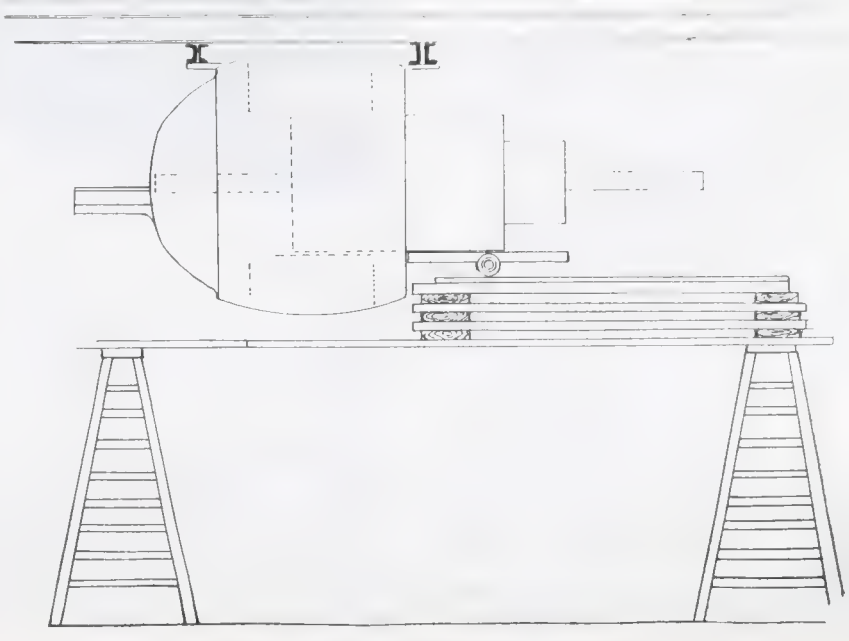
The first actual dismantling would be the removal of the length of shaft immediately adjoining the motor shaft. If there were no pulleys on this length the caps of the bearings would be removed and the length slid back over the hangers far enough to leave room for the armature to come back. If fitted with pulleys these would have to be removed first, though in some cases it would be feasible to lower the whole length of shaft, with hangers and pulleys intact. The shaft out of the way, the next step would be to remove the end housing. This was done by hitching the ½-ton chain blocks to a stringer placed on the ceiling and before slacking the cap bolts holding the housing, taking the weight of the armature on the chain block. The bolts are then taken out and the housing pulled back, the blocks being slacked out till the weight of the armature comes on the field magnets. The blocks are then hitched to the housing and the platform is opened up by removing two or three planks, and the housing lowered to the ground.

On the channel iron to which the motor is fastened, a length of shafting has been left for the purpose of holding the chain blocks. Two pairs of blocks are used, one at each end of the armature. The hook of the chain block at the end opposite to the commutator is passed down through the openings in the housing but is not used till the shaft is just leaving the bearing. It may not be needed at all, but it saves time to hang it up ready before moving the armature. The armature is moved out by the block at the commutator end by leading the block out of the perpendicular so that when tightened up it tends to straighten out, pulling the armature out with it.

By the time that the other end of the armature shaft is ready to leave the bearing another very useful little arrangement is brought into play. This is a small bogey mounted on two wheels at the centre and made with its platform curved to a radius approximately close to that of an armature. Blocking is made up on the working platform till the bogey can be set in just underneath the armature. If the armature is far enough out of the frame to rest on the bogey without tipping, the back pair of blocks will not be needed. Usually, however, the back chain block is tightened up sufficiently to prevent the armature dropping when the shaft comes out of the back bearing. Holding the weight on the two pair of blocks, the armature is worked out until it is fairly over the bogey, and then lowered. This done, the bogey is pulled back on the blocking till the armature is clear of the motor frame altogether. The use of this little carriage saves a great deal of time which would be otherwise used in making fluts and changing blocks. The next step is to lower the armature on to the working platform, which is done by taking a turn on each end of the shaft with the chain blocks and then removing the blocking. This gives more head room and the yoke for lifting can be put on. This is made up of a piece of 3-in. I beam with an eye in the centre for hooking on the blocks. Two pieces of ¾-in. round iron are screwed at each end and bent to a V shape, with the lower end widened out. These fit over the shaft of the armature, the screwed ends passing through the lower flange of the I beam and fastened with nuts. The 1-ton blocks can now be used for lowering. The weight is taken on the blocks, the platform opened up and the armature is lowered on to a truck moved in ready to receive it. This truck is then moved out and the spare armature moved in on its truck. The yoke is taken from the old armature and placed on the new, and it is heaved up. The platform is then replaced and the armature lowered on to it while the yoke is removed. The chain blocks are once more hitched at each end of the shaft, the armature raised up and the blocking put in again with the carriage on top. Working the armature into the frame is probably the most awkward part of the job as the shaft has to be entered fairly into the far end bearing and the oil rings held up carefully till the shaft has passed. The two pair of blocks are used when the carriage has reached its limit.

The armature replaced, the remaining parts of the work do not take long. If all goes well with connecting up the shafting, and couplings can be trued up reasonably quickly, three hours will see the completion of the whole job. This, to remove an armature weighing perhaps 1,000 pounds, and replace it with another, move and replace shafting, and rig platform and gear, is good work.

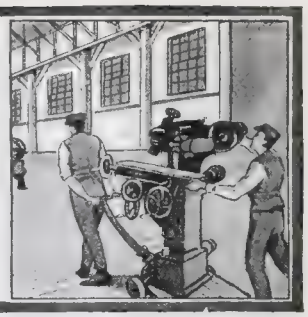
The number of men engaged on this work was usually five for the heavier motors. Of course handling the smaller ones was only a light job, and two to three men were sufficient.



VIEW SHOWING ARMATURE ON BOGIE.



DEVELOPMENTS IN SHOP EQUIPMENT



HEAVY SERVICE DRILLING MACHINE

THE heavy service drilling machine, as illustrated and described herewith, has been designed by the Defiance Machine Works, Defiance, Ohio, to give constant service, without the constant care usually given drilling machines, having embodied in it several features which make it a very rigid and efficient tool. It has capacity, with a large factor of safety, for driving 3 in. high speed drills in solid steel.

The machine is entirely enclosed, which allows a gravity oiling system to be operated with a continuous flow of oil. The oil reservoir is in the bottom of the housing, from which oil is pumped to the top of the spindle, flowing to all parts of the machine and back to the reservoir. This eliminates the human factor in the care of this machine, which insures endurance and long service.

No countershaft is required with this machine, as it is a single pulley drive. The spindle speeds are obtained by means of two cones of hardened gears, running idle except when one set is meshed by a roll-in hardened gear operated by a lever at the side of the machine within easy reach of the operator. This feature is of our own design and eliminates the constant trouble with change gear devices.

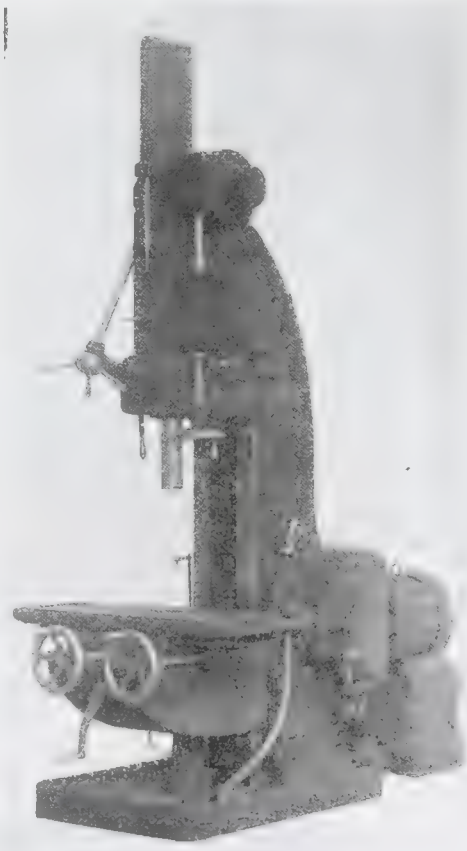
Helical gears are used to drive the spindle; they have two keys through the driving sleeve into the spindle, near the nose, eliminating all torsion to the spindle. The thrust of keys and helical gears is taken by a large thrust bearing. This combination insures smooth motion to the spindle and constant pressure on the drive and feed mechanism, thus insuring long service.

The thrust of the feed pinion on the rack in the spindle sleeve is taken by roller bearings on a centre on the opposite side of the sleeve, eliminating all friction of sleeve in bearing. Hyatt roller bearings are used on all drive bearings, while all slow-feed bearings are bronze bushed.

The spindle is of forged high carbon steel, 3½ inches in diameter at the nose, and our unique drive enables us to drive the spindle at this diameter. The thrust of the spindle is taken by an S. K. F. thrust bearing, which they guarantee to eliminate thrust bearing trouble.

The drive is a unit located in the back of the housing. In this unit there are two cones of four gears each, running idle except when one set is meshed by a roll-in gear. These cones of gears are driven by back gears operated by a high-grade friction clutch located on the pulley drive shaft.

The table is of box type with liberal bearing which is gibbed to the column. It has a vertical adjustment of 15 inches by means of large telescopic screw operated by lever in front of the machine. The screw is located from the centre of the spindle towards the column sufficient to allow boring bars to pass through the table.



GENERAL VIEW OF MACHINE.

Four changes of feed are obtained by means of two cones of gears operated by a lever conveniently located. The power feed stop is obtained by a lever connected to clutch on the worm shaft. It is operated by an adjustable stop rod connected to the top of the spindle, which eliminates the constant trouble with automatic stop devices. The feed is transmitted to the spindle by a large worm gear, the enclosed feature of the machine enabling this mechanism to run in oil together with the fixed centres of the worm and worm gear, gives a powerful worm feed drive. Quick traverse of spindle is obtained by means of a pilot handle within easy reach of the operator.

The tank for the cutting compound is located in the base and is part of the regular equipment. The lubricant is controlled by a single valve near the outlet, the pump having a relief valve.

The compound table is not an attachment to the regular table, but consists of a special box-type bracket to support the intermediate slide and the table, which has a working surface of 17½ in. x 35 in. This table has an adjustment of 18 in. longitudinally and a crosswise adjustment of 9 in. It has three tee slots, running lengthwise, and a liberal oil groove. The screw for elevating is the same as used on the plain table. When the compound table is furnished it is necessary to use a higher column, in order to give the same maximum distance from nose of spindle to table as on the plain machine.

The tapping attachment is extra also, and is an all geared fixture located directly behind the main spindle drive gear. It is operated by a lever to jaw clutch between the forward and reverse train of gears. The feature of the drive near the nose, with two keys through the drive sleeve, with the thrust of the two keys taken on a large thrust bearing eliminates the friction and makes it possible to tap holes without tearing the threads

Capacity with high speed drills in solid steel	3″
Length of power feed	16″
Diameter of spindle nose	3½″
Diameter of spindle drive	3½″
Morse taper in spindle	No. 5
Diameter of spindle sleeve	3½″
Width of steel rack on sleeve	2″
Pitch of steel rack in sleeve	6
Diameter of feed pinion shaft	3″
Pitch of feed pinion	6
Width of helical drive spindle gear	2½″
Centre of spindle to face of column	12″
Maximum distance nose of spindle to top of plain table	32″
Maximum distance nose of spindle to top of compound table	32″
Working surface of plain table	20″ x 22″
Working surface of compound table	17½″ x 35″
Vertical adjustment to table	15″
Four feed changes	.007, .012, .018, .046
Eight spindle speeds	51, 81, 102, 128, 162, 204, 253, 408
Diameter and face of driving pulley	22″ x 5¼″
Speed of driving pulley	425 R.P.M.
Height of machine with plain table	9′ 3½″
Height of machine with compound table	9′ 8¾″

LIBERTY 48 in. OPEN SIDE PLANER

THE Liberty Machine Tool Co., Hamilton, Ohio, have developed the open side planer shown in the accompanying illustration. The design embodies all of the advantages and features of the double housing planer in addition to handling work of unusual width. A notable feature is the rigid construction of the cross rail and column, making it possible to take any cut which the tool will stand, and adapting it to all classes of work required of a modern planer.

The cross rail is triangular shaped with a long and narrow guide extending upward on the front of the column. It is bolted and doweled to the triangular brace or knee. The triangular brace or knee extending to the rear of column, with tongue in rear tee slot, supports the cross rail, and is rigidly clamped with tee slot bolts in the side of the column, in addition to the rail clamp on the front of the column. This construction affords excellent clamping facilities, and the rail remains square with the table when bolts are loosened for raising or lowering the cross rail.

The column is of two post box type construction, extending to the floor. It is bolted and doweled to the side of the bed, and the wide base is arranged for bolting to the foundation.

The bed extending to the floor affords a solid foundation for the machine. The top is closed between the tracks except through the gearing section, which is reinforced by heavy girths. The tracks are wide and "V" shaped with an ample spread to eliminate any unnecessary overhang of the table, and are fitted with automatic oil rollers insuring proper librication. A place is also provided for the operator's tools.

The table is extra deep and heavily ribbed. "T" slots planed from the solid and reamed holes throughout the entire length of table, afford ample facilities for clamping work.

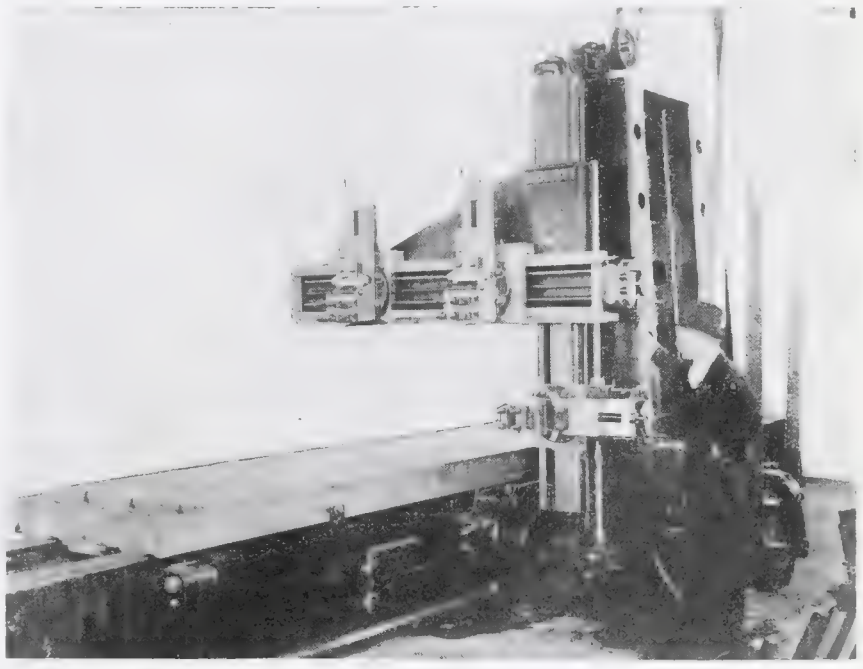
The running gear is placed inside the bed and is easily accessible from the top. The gears are pressed onto the hubs of the pinions relieving the shafts of all torsonial strains. Heavy shafts support the gearing and journal in wick oiled bronze bearings. The pulley or driving shaft has an additional support outside of the pulleys.

The driving pulleys are made of aluminum with cast iron centres, increasing their strength and reducing their weight and consequent inertia at high speeds to a minimum which prevents excessive noise caused by the belts. The loose pulleys have wick oiled bronze bushings and solid web instead of arms to insure safety of operator.

Wide belts insure ample driving power. The shifting mechanism shifts the belts quickly and quietly. The entire mechanism is enclosed, avoiding the accumulation of dirt on the cam and other moving parts. The belt arms are adjustable to keep the belts in the proper position at all times and they have an additional support on the pulley bracket, relieving the fulcrum stud of a bending strain. By means of shifting levers on both front and rear sides of the machine the operator can control the motion of the table without walking around the planer. A safety lock secures the shifting mechanism and prevents accidental starting of planer table.

The patented feed is a decided improvement over the old style arrangements, and has the following advantages:

1. The operator can control or change the feed on cross heads at any time without stopping the machine or disturbing the feeds on either right or left side heads or vice versa.
2. All parts are well protected, yet easily accessible.
3. Convenient location of all operating handles and knobs.



OPENSIDE PLANER

4. The amount of feed is indicated by a dial conveniently located, enabling the operator to set the feed to the proper amount to suit requirements.

The rail heads have long and wide bearing surfaces on the cross rail and are made right and left for close range. They are graduated for swiveling up to 90 degrees in either direction, and have automatic feeds in all directions, operative from either end of the cross rail. The down feed screws under strain, are in tension instead of the usual method of construction. The slides are hung on ball bearings. Binder screws are provided on both saddles and slides. Micrometer adjustments are provided on all vertical and horizontal feed screws.

The power elevating device is located on the top of the column. A long handle on the rear side of the column operates a saw tooth clutch for raising or lowering the cross rail. The handle must be held in position while operating and any obstruction will instantly disengage the clutch, thus avoiding any breakages. All gears are idle when not in use.

The side head is mounted on the front of the column, the same as our standard planer, avoiding unnecessary overhang, of the tool, which is brought up close to the point of support. It is properly counterbalanced and can be moved below the top of the table when not in use. The patented feed, micrometer collars, and control handles, are all conveniently located on the heads and move up and down with same. They are graduated for swiveling up to 90 degrees in either direction. Binder screws are provided on both saddle and slide. The tool block is fitted with a self-releasing spring plunger.

The countershaft is equipped with Hyatt Roller Bearings throughout, and all pulleys are properly balanced, insuring continuous operation and delivering the maximum power to the machine. The only attention they require, is lubrication three or four times a year.

When it is desired to use this machine as a double housing for head planer, the left-hand housing and head can be attached at any time, as the machine is arranged for same. The machine can be arranged for either belt or motor drive. All parts are made to jigs and are absolutely interchangeable. The unit system of parts, make it possible to attach any additional unit, such as heads, or various motor or belt drives, at any time, after the planer is installed.

WELLAND.—The Imperial Oil Company are about to build a plant for handling their product, at a cost of about $40,000. From Port Colborne comes the news that the potash plant that has been under consideration by the Canada Cement for the last three years will be proceeded with. The cost will be about $500,000.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-President
H. V. TYRRELL, General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly journal devoted to the machinery and manufacturing interests.
B. G. NEWTON, Manager. A. R. KENNEDY, Managing Editor.
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Office of Publication, 143-153 University Avenue, Toronto, Ontario.

Vol. XXI. MAY 15, 1919 No. 20

Shipbuilding and Steel Plate

THE shipbuilding campaign in Canada will be gone on with. That much is certain from statements made in the House at Ottawa. Recently Hon. C. C. Ballantyne, the Minister of Marine, announced that the Government proposed to place with yards requiring business enough additional orders for ships to keep them employed for the balance of this year and probably into 1920. The boats are to be operated on both oceans and on the Great Lakes and St. Lawrence route in connection with the national railways. Some members were inclined to suggest that the cost of the ships, $180 to $215 a ton deadweight, was excessive. The Minister, however, pointed out that Canadian prices were lower than those in United States by approximately $25 a ton, and that prices in Britain had trebled during the war. Mr. Ballantyne also announced that the contract for the purchase of steel plates from the Dominion Iron and Steel Company, which has been subjected to some criticism, would be modified in conformity with the present price of steel in the United States or cancelled, the company not having proceeded very far in the erection of its plant at Sydney, C.B.

The reference to the cancelling or changing of the contract for the rolling of ship plate by the Dominion Steel Corporation brings to mind a contract that was made during the war, in fact, it was sanctioned about the end of March, 1918. At that time four companies submitted propositions, some of them on short notice. The firms were the Dominion Steel Corporation, Nova Scotia Steel and Coal, Canadian Steel Corporation, and the Dominion Foundries & Steel, Hamilton.

The contract went to the Steel Corporation on the understanding that the Government was to purchase 250,000 tons of steel plate at 4.15c per pound, spread over a period of five years, with the option of increasing this amount if desirable. The cost of 4.15 is based on the ingot cost, and if that is not below $25 per ton then the company could claim 4.25c per pound for its plate. It is a safe guess right now that the Steel Corporation could never produce ingots at $25 per ton, as billets, which are quite closely related to ingots, are marketed at Pittsburgh now at $38.50 per ton, and it is safe to say that a new mill could not clear out that much difference in price.

The agreement also provided that rolling plate should begin 18 months from the date of the contract, which would mean that the plate mill should be in operation by the 26th of September of this year. The admission of the Minister of Marine that "the company had not proceeded very far in the erection of the plant" is equivalent to saying that it would be a year yet before there would be any plate rolled, or even longer. So if there is to be work carried on at once in the building of a marine fleet it is certain that the great portion of the plate, with the exception of what the Nova Scotia Steel and Coal Co. can roll, will have to come from U. S. mills.

It is urgent that this country should have tonnage at its disposal for carrying its exports and imports, and it is not well that construction should be delayed or held up until plates can be rolled here in sufficient quantities to meet the demand.

U.S. Capital in Canada

ACCORDING to a report just issued, the amount of capital from the United States which is invested in Canadian manufacturing plants has almost doubled since 1914, though the number of concerns involved has grown less.

The number of plants to-day is given as 388, with an investment of about $265,000,000 in paid-up capital. This estimate is stated to be approximately correct, for, although the companies included in the list may have many Canadian shareholders, on the other hand, many apparently Canadian companies have a large proportion of their stock owned in the United States, so that the capital sum mentioned is probably conservative.

The increase of $130,000,000 in American investments in Canadian manufacturers is an indication of the growing importance of Canadian industry in the eyes of outside investors. It also shows that our neighbor to the south is still available as a field from which to secure capital for the development of our resources.

Many companies which were purely American in 1914, have since had their stock acquired by Canadians, and are now rated as purely Canadian investments.



PERHAPS IRELAND WANTS TO BE RECOGNIZED BEFORE IT'S TOO LATE. Darling.

Cutting Out Useless Lines

THE Canadian Reconstruction Association has issued an interesting book on "standardization and specialization," with the object of impressing on the Canadian people the need for paying attention to standardizing, and doing away with a lot of needless and costly design for purposes of talking points and competition.

The experience of Canadian shops in the turning out of shells gives the committee a good talking point. Canada had never before made a cartridge case or a fuse, nor a 4.5, 6-inch, 8-inch, or a 9.2, or an 18-pounder. And yet how well the country succeeded. Each plant put its best efforts toward some certain, well-defined standardized part.

In the United States the thing has been carried farther during the war than at any other time, and it now remains to be seen to what extent the industries there will follow up the lessons of the war.

In the automobile industry standardization has played a most important part in the rapid development of the industry, not only in parts, but in tires.

Baby carriages show big reductions in designs. Reed carriages were cut down from 160 patterns to about 30, and the chances are that the rising generation get wheeled and trucked and fresh-aired to just as good advantage in the 30 varieties as in the 160.

Biscuits and crackers were lines in which it was a mighty poor day that did not see a new sort chased out on the market looking for public favor. The cracker bakers have cut down their lines more than 50 per cent. Before the movement for standardization got a start there were over 1,000 different lines made by the cracker bakers. Nor has it been heard yet that any harm has been done by ditching the making of 500 designs of crackers.

Paving brick have been brought to a standard size, 3 ins. x 4 ins. x 8½ ins., and apparently it will be only a matter of time before all the makers come to this size.

In the manufacture of carriages, especially in the essential parts, there has been a big movement. One manufacturer says: "We believe there is not an industry in which there has been more radical changes made than in this. For instance, axle spindles from unlimited styles and shapes, applicable to each individual's ideas, necessitating the axle manufacturers producing hundreds of different styles of buggy axles, together with bushings for each individual style, all have been reduced to one type axle spindle, which will be used by all manufacturers of light horse-drawn spring vehicles."

Perhaps there is no greater change to be noticed than in the manufacture of pocket knives. C. W. Silcox, secretary of U. S. pocket knife industry, states: "Prior to the war many manufacturers in this industry were making as high as 650 basic patterns of pocket knives and from these 650 basic patterns were evolving in some instances as high as 6,000 and 7,000 distinct numbers. Under Government regulations the basic patterns were cut down to 85 basic patterns with only 250 knives to be evolved from same, which very materially reduced the manufacturing costs. Our lines were standardized and each factory made out of the 85 basic patterns 58 basic patterns that were all of the same general character.....We found that we were all paying for a lot of things that were absolutely unnecessary, that made the ultimate consumer pay a fictitious price for this class of merchandise."

There is a great big field here for Canadians to work in. If U. S. manufacturers find it a good thing, it ought to be worth considering here.

A GOOD method has been discovered to make money out of mining and oil stocks. Stay out.

The Joys of Camping Out

HE thought he'd take some holidays and so he got a tent, to camp beside the babbling brook and save a month of rent. He got some pickles and some ham, some salmon and some tea, and every kind of fodder that his cooking eye could see.

And then he got a tiny bed, a blanket and a sheet, to keep the spiders and the bugs from rompin' on his feet.

He also bought a fryin' pan and took a spoon and knife, and told his friends that he was off to lead the simple life. The boarding house he would forget and all his troubles there, and just commune with nature and devour the clover air.

The day had been so beastly hot, it added to his zest to reach the shady wooded spot and chuck his coat and vest.

The camper ate his humble meal and lined up his interior, and swore, by gum, that campin' was a system most superior. He lit his pipe and in the dusk he puffed great clouds of smoke, and dreamed he wuz an Injun brave 'way down at Shogyhoke.

And then he tumbled into bed to dream of joys in store, and the woods re-echoed for a mile with a most gigantic snore.

And the sun came peepin' in at him and he chuckled out with glee, "By all the jumpin' hottenots, this is the life for me." He made a rush to get a meal just like a hungry horse, for this tentin' in the woods had roused his appetite, of course.

But the ants were in the butter dish, and flies camped on the ham, and fourteen different crawlin' things were in the fryin' pan.

The bugs were swimmin' in the milk, though some of them were dead, and the worms had set up keepin' house inside his loaf of bread. He said a lot of sizzlin' words, they just ran out like strings—he's boardin' by the week again on hash and prunes and things.—Ark.

ONCE the Allies finish up the peace terms the next thing is to polish off the man who started the whole thing. At present he's hiding behind a Dutch bedstead.

* * *

WE are now approaching that peculiar season of the year which is punctuated at painfully regular intervals by rhubarb sauce, rhubarb pie, rhubarb pudding, rhubarb, etc., etc., etc.

* * *

CITIES shove up taxes on vacant land to make the holders sell. Very good. But in so doing they simply put the price of vacant land where the real honest-to-goodness builder can't touch it.

* * *

ON May 7, 1915, the Germans sank the Lusitania, and on May 7, 1919, the peace terms were handed to them. It took four years, but the wind was sown and the whirlwind was the harvest.

* * *

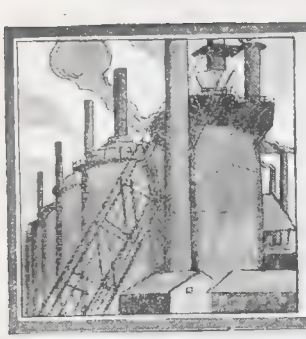
THE box car is the greatest industrial loafer that we have heard of for some time. In fact, some railroad man with a mania for figures has it figured out that if the box car came to work at 10 in the morning the whistle would blow at 12 minutes past 11 for it to quit work. The rest of its time it is hanging around on sidings and waiting to be loaded or unloaded. As there are some 2 500 000 freight cars in United States alone, the amount of loafing this collection does must be staggering in the aggregate.

* * *

THE scrap metal market, like the scrap market in Europe, is quiet this week.

* * *

OUR idea of a steady job is being janitor of that airdrome in Newfoundland where those trans-Atlantic flyers are going to start from.



MARKET DEVELOPMENTS



Is an Open Market Coming in Steel Trade Now?

Things Are Moving Rapidly in United States—Woodworking Machinery is Selling Well Just Now—Some Adjustments Have Been Made in Regard to the Shell Contracts

DEALERS selling woodworking machinery are having a good season. This holds good, from inquiry made from several of the leading Canadian houses. In fact, this line of business is having a better time of it just now than the metal working end. Some of the concerns that have been in the process of tooling up with the purpose of turning to new lines, have been tied up for some days now in these operations, and are simply waiting a turn in events before they can proceed.

The work of making adjustments for the cancellation of war contracts is proceeding more rapidly now, and some claims have been settled, although there are a number of others to be dealt with yet.

Canadian dealers in steel, including plates, structurals, etc., have been watching with considerable interest the developments that have been taking place in United States in regard to returning to an open market. The resignation of the Industrial Board, and the announcement that the fixing of prices has not the approval of the Department of Justice, leaves the steel makers with no medium for the establishment of lower prices. Hence about all that is left is to maintain present values or face the alternative of bringing in an open market.

Canadian orders that are going across the line to the U. S. steel mills are, in many cases, accompanied by a stipulation that should there be a change in prices by the time the order is filled, the buyer here shall get the benefit of the change. This especially refers to any orders that will not be filled for three or four months yet.

Scrap yards have had a poor season of it. In fact, since the signing of the armistice there has been nothing worth while in the business, and some of the dealers with large overhead expenses have probably lost money.

MONTREAL DEALERS LOOK FOR BETTER SALES OF MACHINE TOOLS

Special to CANADIAN MACHINERY.

MONTREAL, Que., May 15.—Business activity is still of a character where immediate needs are the pivot of operations, and trading in futures is still held in abeyance, although the general prospects are more encouraging. Work on the harbor extensions and improvements is rapidly taking shape, and this will act as a stimulant to other enterprises. Steel trading during the week has not been heavy, but prospects are better. Metals are in the same quiet state with the situation unchanged. The inquiry for machine tools has been picking up, but the business passing is not heavy. Scrap is dull and without feature.

Steel Shows No Change

Dealers here do not look for any marked changes in the steel situation as a result of the recent developments in the States, when the market virtually became free from all restraint through the resignation of the Industrial Board officials.

It is not likely that any material change will become effective in steel prices, as it is generally recognized that the present scale is of a satisfactory character when all circumstances are taken into consideration. It is believed in steel circles here that the producers will adhere to present prices as they contend that lower prices would mean operating at a loss, and sooner than do this the mills would close. Labor conditions, not only in the steel trade, but in all the primary industries, are not conducive to lower production costs, and if trade activity is to become stabilized, manufacturers and the country generally have got to recognize the situation as it really is, and embark on a constructive programme irrespective of the seemingly high cost of labor and material. Operative industry is the only guarantee of progress, and hesitation and delay will only make the situation more complex and dangerous. Some doubt has been expressed as to the permanency of the shipbuilding industry here in Canada, but it is more than likely that operations will be continued, even if some curtailment is considered advisable. Steel warehouses are gradually taking on a more pre-war appearance and stocks carried are of a more general character. The week's activity in steel has been exceedingly quiet, and consumers have been holding off, apparently anticipating further price adjustments to a lower level. The coming week will probably show the actual condition of steel, as open competition will demonstrate any weak points in the armor of the producers. Price quotations here are firm and show little indication of early revision.

Machine Tool Inquiry Improves

Summing up the various reports that are gathered from different sources in the machine tool centres, it would appear that a gradual return to more normal activity is noted, although some dealers state that things are still quiet. The general opinion appears to be that good business will eventually be realized should all inquiries result in business. As stated by one dealer: "The better inquiry that has come to hand during the past two weeks would seem to indicate that feelers are going out for the purchase of new equipment, but as yet these inquiries have not resulted in many sales. There is, apparently, a waiting attitude being assumed by many, with the expectation that lower quotations will prevail, and with this tendency developing as it is doing in some lines, the possibility of actual business is more encouraging." It is reported that a certain well-known lathe manufacturer has recently reduced prices on standard tools

25 per cent. Labor conditions and material costs are seemingly detrimental to any serious cutting of prices, but on the other hand, a courageous attitude in this connection may tend to establish a better working basis and a renewal of demand that cannot but aid in the ultimate readjustment. Some dealers here have been doing some little business in connection with the fitting out of the St. Malo shops at Quebec. General sales are light, but far from discouraging. The supply business has shown slight improvement and sales are of fair volume.

Depression in Scrap

"Continued depression is the dominating factor of present business and the actual movement of material is exceedingly light. There is just sufficient doing to demand our presence at the office and yard, but apart from that the interest in scrap is almost wiped out, small local demand being steady but light in character." This statement from a dealer here outlines the present situation, but the development in the steel trade in the States may be the forerunner of better conditions, although optimism for the immediate future is not pronounced.

Circumstances are against a sudden readjustment of working conditions to a pre-war basis, and with this factor influencing the market as it does, trading of an expansive character is not anticipated until the European atmosphere has become more clear. The old material situation maintains its quiet and disinterested position, with dealers patiently awaiting trade developments. A slight advance in red brass turnings is the only change this week, the quotation being 9 cents per pound, an advance on the week of 1 cent per pound.

GO AFTER EVERY BIT OF BUSINESS

Keen Competition for Anything That Shows Up in the Steel Situation

TORONTO.—Dealers who sell steel in any form are after business at present. It is a long cry from the condition of affairs a year ago for instance. During the war the man who had steel for sale, or who knew any person who could find any for sale, was a favorite individual. Every person in sight wanted to see and know him. Now the man who has steel for sale wants to make the acquaintance of any person who has any notion of making a purchase. There is keen bidding now for every order of any size that gets out into the market.

There is a lot of small business coming along, but not in the quantities that the dealers and the mills want in order to run the plants up to something approaching capacity. Some of the warehouses here are having their own little financial funeral too in getting cleared out of the remnants of their war stock. For instance one firm sold a lot of 1,000 bars of iron to a big Canadian industry during the week, the price being 3.50c per lb. This material had cost them a little better than 4c per lb. to put in during the war period, but their best policy is to clear out as soon as possible, and get their money working again. It is peculiar how things work in a circle. This material was placed there from the Pittsburgh mills in the first place. Now the price of 3.50 was placed to meet the Hamilton price of 3.20 on this stock, and the Hamilton price was placed to meet the Pittsburgh price of 2.35, so in the end the Pittsburgh price is chasing out Pittsburgh material that was sold here some months ago.

About Prices

Dealers are not promising their customers anything in regard to prices. In fact they do not seem anxious to mention the chances of any more reductions in price, for they do not believe that a cut would make any great difference in the volume of business passing. If it did not do this it would simply make it harder to make steel at the price. It is interesting to note, too, the great difference there is in the way in which dealers view the matter of the fixed price. Here are two views, both secured by CANADIAN MACHINERY within an hour:

No. 1.—"Nothing but an open market will meet the present situation. Suppose we have another cut in steel, it will leave things in the same position as they are now with a fixed price, and that is the objectionable feature. Throwing the market open now would not mean that the market would run wild, for the very good reason that the plants could not stand it. It would not mean a price-cutting time, but it would restore competitive selling, and I believe that industry in general would favor that very much."

No. 2.—"The fixed price idea is right. The buyer who goes out to secure his raw material knows that his competitor is not buying to better advantage than he is. It gives a better deal to the small buyer who can go out and get goods at the same price as his more powerful competitor. I find that nine out of ten of the larger buyers prefer the fixed price, where they know that the same price that they buy is being charged to all others in the same line of business, with whom they have to compete."

Demand for Motors

There is a good demand for motors right now, and it looks as though it were a fairly good time to buy. There has been a recent drop in price of about ten per cent., but some of the dealers seem quite certain that this will be put back owing to labor and other costs. It might not be out of place here to pass on a word of advice to the prospective purchaser of a motor, especially a person who is not expert in these lines, and who might be fooled on a used machine. The best way to get a used motor, if you decide on this, is to go to some recognized, reliable dealer, and do business through him. In this way you can get his guarantee with the motor. Otherwise, unless you are expert in the matter of motors, you are taking more or less of a chance, which is poor business in connection with your source of power.

The Machinery Market

Several dealers who handle woodworking machinery stated to-day that affairs with them were most satisfactory, and that business was developing nicely.

The strike of the machinists is having the effect of holding up the work of going ahead and tooling up several plants which have turned from war lines to peace work. This seems to be more pronounced in Toronto and immediate district than in the other centres of the Dominion.

BRIDGEBURG.—The placing of additional trains on the Toronto, Hamilton and Buffalo Railway, and the Michigan Central, has resulted in much better business along the frontier. Additional engines have been put to work on the International bridge, hauling freight into Canada at this port. The new yard of the T. H. & B. will be used for all westbound repairing, and will likely employ more men before long.

POINTS IN WEEK'S MARKETING NOTES

The scrap metal market in Toronto remains inactive. Dealers are making few sales of only small amounts.

—

Opinion in Canada seems well divided as to the advisability of having an open market for steel or the fixed price.

—

Machine tool dealers report the sale of woodworking machinery as being quite satisfactory. In fact in some cases the demand can be called brisk.

—

Some of the shops in this district have had adjustments made on their war contracts with U. S. Government. Russell Motor have finished on their fuse and adaptors, but not on the shell work.

—

Some of the shops that were tooling up for new lines are tied up on the work owing to the strike.

—

The rate of production at the U. S. Steel Mills continues to decrease, and is not now over the 60 per cent. mark.

—

Montreal dealers report better business with the opening of navigation.

—

Warehouses are not buying as heavily as usual as there is not the demand for this as yet.

—

Some orders for steel are being accepted at the U. S. mills on the understanding that prices shall be adjusted to time of delivery, if any change has taken place by then. This refers to orders that will not be filled for two or three months.

STEEL CONTROVERSY HAS TIED UP THE SELLING OF MACHINE TOOLS

Special to CANADIAN MACHINERY.

NEW YORK, May 15.—The amount of actual buying of machine tools and allied equipment in Eastern markets forms only a small percentage of the volume of inquiry. This has been the situation for many weeks past, and no change has yet taken place, though some hope is expressed that the ending of the controversy over steel prices may cause some buying to go ahead.

The last chapter of the steel price controversy took place in New York last Thursday when representatives of the Railroad Administration and the general committee of the American Iron and Steel Institute met to reach an agreement, if possible, on purchases of steel by the Railroad Administration. The steel manufacturers refused to make any further reduction in prices, so the railroad representatives announced that the meeting was unsuccessful. A day or so later the Industrial Board of the Department of Commerce, which had instituted the price stabilization plan under authority of President Wilson, resigned, and the whole program has therefore been abandoned. The last straw is the statement of Attorney-General Palmer, made public after the resignation of the Industrial Board had been accepted, that the price stabilization program had no legal standing. This may be intended as a warning to the steel trade not to maintain by any agreement the prices which were adopted by virtue of the price stabilization plan. There is, therefore, an open market in theory, though it is very doubtful whether there will be any important reductions in prices.

If there is a resumption of buying in steel products, it would naturally affect other industries which are allied to the steel industry, one of which is the machine-tool industry. There is every indication of a potentially large demand for machine tools, and it needs only the starting of a general buying movement to bring about action on the many inquiries for tools which are now pending.

There has been no important domestic buying during the past week, but a fair number of orders for single tools has been received. The only export buying which is going ahead is for a Belgian automobile plant, whose representative, now in this country, has begun placing orders for about 100 tools needed for the rehabilitation of that factory, which was destroyed in the war by the Germans.

The spring meeting of the National Machine Tool Builders' Association takes place on Monday and Tuesday of this week at the Hotel Traymore, Atlantic City, N.J., and some definite action may be taken relative to disposal of the new machine tools owned by the Government. These tools the Government authorities wish to turn back to the manufacturers, the latter in turn to dispose of them on a 7½ per cent. commission basis, which many of them assert is not sufficient. While the number of new tools is small in comparison with the number of second-hand tools which must be sold, nevertheless they form quite an item, and are a source of worry to the machine-tool builders.

PITTSBURGH MILLS HANDLY GET PAST 55 PER CENT. OF CAPACITY NOW

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., May 15.—The resignation of the Industrial Board at Washington, announced last Friday evening, causes the steel market, technically, to enter a new chapter in its history, but practically there is no material change. The Industrial Board had practically been dead since the very publicly-announced refusal of the Railroad Administration, about April 1, to take part in the programme the board sought to force upon the various purchasing agencies of the Government as well as upon the public.

The program announced for the board before it was actually appointed received general approval and was an excellent one. The trouble of the Industrial Board arose from its departing from the program. This departure was caused by the board being hypnotized, or deceived, as some have expressed it, by the representatives of the steel industry. The object the board was expected to attain was the immediate deflation of prices, that is the development at once of the prices in which buyers would have confidence, and at which they would be willing to take hold. Otherwise, left to themselves, the markets for the various building commodities, including steel, would decline but slowly, as prospective buyers waited, and the return of activity would be correspondingly delayed. This program the board did not carry out, as the reductions it secured for steel products, announced as effective March 21, were not sufficient to create confidence in the minds of buyers. The basic idea was to make prices so low that buyers would expect advances rather than declines, but the Industrial Board endorsed prices that did not create any such expectations.

Columns of newspaper space have been used up in the discussion of the "controversy" over steel prices without the simple and fundamental difficulty being explained. That difficulty was simply this, that the prices the steel producers proposed were based on costs which were inflated by heavy overhead, caused by light operation. The steel producers desired that the heavy overhead per ton (they are now operating at about 55 per cent. of capacity) be represented in the prices. If they had full operation they admitted, privately, that they could be content with lower prices. Buyers, take the opposite view. When the law of supply and demand has full play, the lighter the demand the lower the price. Light operation was made an excuse for high prices, while buyers feel it ought to be a reason for low prices. That is the reason the Industrial Board failed. Furthermore, seeing that the reductions of March 21 were relatively small buyers, including the Railroad Administration, felt that what was in force was an agreement to maintain prices. It was well known that the approval of the Department of Justice was sought by both the Industrial Board and by the steel producers, and was refused. That such approval was applied for was interpreted as meaning that the parties to the arrangement felt that the approval was needed.

With the Industrial Board out of existence, by reason of the acceptance last Friday, by Secretary Redfield, of the resignations that had been tendered two or three weeks earlier, the steel producers have no means whereby they can establish the market on a lower level, hence their alternatives are only to maintain existing prices or to throw the market open to competition, allowing prices to settle where they will. As the producers are much afraid of competition, more afraid than they need be, in the judgment of many observers who are not steel producers, they choose the former alternative, and will maintain the March 21 prices as best they can until something fresh turns up. While as a rule the steel producers are unwilling to admit it, they know that it is altogether improbable that buyers of steel will take hold in liberal fashion until the market is thrown open. It is not that buyers have certain definitely formed ideas as to the prices at which they should be able to buy, their feeling rather being that there should be an open market, whereby whatever prices were developed would be such as would command confidence. The producers feel that it is too early for liberal buying to develop, at any prices, hence they wish to defer abandonment of the present price maintenance understanding. There are many observers who do not agree with this judgment, believing on the contrary that if the market were thrown open liberal buying would develop within a short time, perhaps in less than three months, and that thereupon prices would show an advancing tendency.

Production Decreasing

The monthly report of the American Iron and Steel Institute shows that in

April there was produced 2,239,711 gross tons of ingots, by 30 companies which in 1918 made 84.03 per cent. of the total output. This means that the industry produced ingots in April at the rate of about 31,900,000 gross tons a year, which is 65 per cent. of the capacity, estimated at 49,000,000 tons. For preceding months the proportions were: March, 77 per cent.; February, 85 per cent.; represents a large tonnage, considerably greater than the output in 1906, when existing capacity was pushed to the utmost and mills were nevertheless falling behind in deliveries. To the producers, however, the idle capacity of 22,000,000 tons a year is much more impressive than the operating capacity of 27,000,000 tons, the fear being that nothing could be done, by way of making attractive prices, to engage the 22,000,000 tons, so it is better to make as much profit as possible out of the 27,000,000 tons. According to the present market trend, however, production is in line for further decreases, as new bookings are relatively light and old orders are being completed, with not enough new business to take their place.

The Steel Corporation's unfilled obligations decreased during April by 629,887 tons, leaving 4,800,685 tons on books at the end of the month. This is a slightly larger decrease than was shown for March, but is a smaller decrease than shown for any of the three months preceding March. What makes the showing particularly unfavorable, however, is the fast that shipments during April were much smaller than shipments in March, probably at 70 per cent. of capacity against more than 80 per cent. in March, and the April bookings, therefore, must have been much lighter than the March bookings. The April loss in unfilled tonnage was equal to about 48 per cent. of the capacity, and deducing this from the 70 per cent. shipments indicates that bookings were only 22 per cent. of capacity, this comparing with estimates averaging in the neighborhood of 35 per cent. for each of the four months preceding.

There has been an "open market" in pig iron since about April 1, but prices have been declining very slowly, partly because there has been little inquiry to tempt furnacemen to cut prices, and partly because costs are so high that there is not much room for cutting, it being preferable to go out of blast. In the past ten days various sales have been made in the local market, involving lots of 200 to 500 tons of foundry iron, and cuts averaging in the neighborhood of a dollar a ton. Southern iron, for May delivery, has sold at $24.50. Birmingham, for silicon 1.75 to 2.25 per cent., and at $25 for silicon 2.25 to 2.75 per cent., these being cuts of $2.25 and $3 respectively from the prices that became effective March 21.

SCRAP IRON MARKET IS DULL AND NO SIGN OF ITS BETTERING

Continued dullness is reported from practically every point. Prices decline as the result. Following are reports from leading U.S. points:

NEW YORK. — Heavy melting steel remains steady, but stove plate, grate bars and wrought pipe have declined from 50c to $1. The railroads are putting scrap on the market regularly, and stocks are believed to be accumulating in dealers' yards. The Pennsylvania sold 35,000 tons miscellaneous scrap last week.

PHILADELPHIA. — Nothing has transpired to test the capacity of the market during the week. Some heavy melting steel has been sold at $15, and wrought pipe at $17 to $17.50. Machine shop turnings from $10.50 to $11, and cast borings from $12.50 to $13.50.

PITTSBURGH. — Some grades are holding firm, but others, such as machine shop turnings, are showing weakness. Offers are from $10 to $10.50, with most at the lower figure. There is practically no demand for phosphorous steel scrap but heavy melting steel remains about $15.50 to $16.

BUFFALO.—The tendency of dealers is to wait till the market opens up. There is a good local demand for cast scrap, and from outside comes enquiry for borings and turnings.

CLEVELAND.—There is little tendency on the part of consumers to buy scrap. The dullness in the iron and steel market is affecting the scrap market, and dealers anticipate no change till after the price fixing controversy is settled. No. 1 cast has dropped $1.50, while heavy cast is off $2.

CHICAGO.—Current needs of consumers being pretty well covered by reserves in stock, there is practically no business being done in iron and steel scrap. The offerings of the railroads are being taken up without any trouble. These amounted to about 10,000 during the past week.

CINCINNATI. — There is little call for foundry scrap, sales being in lots of between 50 and 100 tons. Prices are unchanged.

ST. LOUIS. — Dealers are absorbing railroad offerings at rock bottom prices. This is about the only business that is being done. Although prices have been marked down from 50c to $1, actual transactions are so rare the decline is nominal.

BIRMINGHAM.—Dealers' yards are pretty well stocked up, but they are not anxious to sell at present prices. No. 1 cast and heavy melting steel are the only grades showing any demand.

Tenders will be received up to 12 o'clock noon, Tuesday, May 27th, by the chairman, Board of Control, Toronto, for the following supplies: Machine shop equipment; basic sulphate of alumina; belt conveyor and appurtenances. T. L. Church, mayor.

MONTREAL NOTES

The Kirkwood Steamship Co. are inaugurating a freight line to run between Montreal and Chicoutimi. This line will commence operating about the 15th of May, with the steamer Glen Allen. This vessel has been employed in the Lake Service, but is at present being fitted out by Messrs. Forest, Jackson and Forest, of 222 Craig St., Montreal, for ocean service.

At a recent meeting of the executive of the Quebec division of the Navy League, held at the Montreal headquarters, 156 Metcalfe St., it was decided to pursue with greater effort the training of boys for sea careers, and likewise to urge the Dominion Council of the League, at Toronto, to purchase the premises now occupied by the Montreal branch, so that the same could be remodelled to meet the special requirements and objects of the League. Chief Petty Officer F. K. Green has been added to the Montreal staff to supervise the work of training the boys.

A satisfactory settlement has been arranged between the Canadian Car and Foundry Co. and the striking employees and the men have returned to work, after a few days' idleness. The adjustment is based on a 9-hour day for 5 days a week, this to be effective at the expiration of sixty days, as the men have signified their willingness to work on Saturday mornings for such a period, owing to important Government contracts now under way. Substantial increases have been granted, more particularly to those previously receiving a low rate of wages. In addition to the better wage scale and working hours, an industrial council has been formed whereby better co-ordination between the men and the firm will result. The committee appointed by the men will not act as a grievance committee, but rather in the nature of an advisory body. Meetings will be arranged weekly or bi-weekly to discuss the matters affecting current operations and working conditions, and each side will be open to make suggestions for greater plant efficiency and closer relations between the worker and employer.

Forest, Jackson and Forest, 222 Craig St. West, Montreal, have taken over the Canadian agency of the Canton Foundry and Machine Co., of Canton, Ohio, manufacturers of the Canton portable cranes.

Another successful launching took place last week from the yard of the Canadian Vickers, Ltd., when the steel cargo steamer "Canadian Seigneur," 8,400 tons deadweight, was placed in the water, without the usual official ceremony. This is the fourth vessel of the Canadian Government's cargo ship program to be turned out at these yards. It was interesting to note that the S. S. "Canadian Ranger," which was launched about three weeks ago, was lying in the fitting-out basin, completed. A few days later she steamed up the harbor to take on her initial cargo. The 7,500 ton

cargo steamer "Sammanger" recently arrived in port, after completing four trips to Australia, was also constructed at Vickers' yard, having been built last year for Norwegian interests, but handed over to Messrs. Furness, Withy and Co., which firm is still operating her.

The first official banquet of the Council for the Development and Direction of Technical Education was held last week in the Montreal Technical School, and was presided over by Sir Lomer Gouin, Premier of the Province of Quebec. This council has been formed for the purpose of increasing the scope of the work of the school, enlarging the membership, and generally bringing to the aid of technical education all that could be obtained for the purpose from all sources. The general council will be composed of four committees, one to seek out new ideas, another of teachers, another of former pupils, and a fourth of manufacturers, these four committees to send delegates to a central board of directors, which would decide on all suggestions.

If expectations are realized the St. Malo Railway shops at Quebec will be ready for operation about the end of June. The laying of the track necessary to connect the shops with the main line is now under way, and as soon as these are completed, the machinery will commence to arrive. It is stated that Mr. Enright, at present connected with the I.C.R. at Moncton, will be given the position of mechanical superintendent of the Quebec shops, and will shortly take up his new duties and supervise the employment of competent mechanics.

The early opening of navigation has enabled Montreal to get a good start in export business, which, so far this season, has exceeded to a large extent the exports for the corresponding period of last year.

A convention of Canadian chemists from all parts of the Dominion will be held on the 16th and 17th of this month, at the Windsor Hotel in Montreal, for the purpose of organizing an association embracing chemical engineers, industrial chemists, research chemists, and chemists engaged in educational institutions. Owing to the remarkable achievements that have been accomplished during recent years, respecting the greater efficiency of industrial plants, by chemical laboratories and scientific investigation and development, this convention is considered one of the most important steps in the forward movement of this industry. Convention proceedings will be conducted by Prof. W. L. Goodwin, of Queen's University. Robert Job will be chairman in charge of the convention, and G. D. McIntyre will act as secretary.

The Maple Leaf Manufacturing Co., Ltd., has recently been incorporated to carry on the manufacture of commercial motor trucks. The personnel of the directorate is identical with that of the Machinery and Munitions, Ltd., which for four years carried on extensive operations in the making of munitions, at plants in Lachine and Sorel. The former plant has been taken over by the new company, and the Windsor plant and general interests of the Menard Motor Truck Co., which has been engaged in motor truck manufacture since 1908, has also been acquired. The Maple Leaf Company will manufacture standard motor trucks and all truck parts, for both domestic and export trade. It is expected that a big business will be built up with the group of countries with which Canada enjoys favored agreements. The officers of the new company are: Kenneth Molson, president; W. B. McLean, vice-president; F. E. Mahon, secretary-treasurer; Louis Livingstone, sales manager.

Chas. Wheeler has resigned his position as superintendent of the Spartan Machine Company in Montreal, and will take an extended trip to Australia. Before associating himself with the Spartan Machine Co., Mr. Wheeler was general superintendent of the St. Lawrence Machinery Company.

W. J. Espey, who for the past two years has been connected with the Canuck Supply Co., Montreal, has accepted a position with the Herald Press, in the sales and service department.

At the annual meeting of Armstrong-Whitworth of Canada, Limited, held last week in Montreal, H. H. Vaughan and Lawrence Russell were appointed to the Board of Directors. Mr. Vaughan will become actively associated with the operation of the company's plant at Longueuil, P. Q.

Tenders are being called for additions to the roundhouses at Hanna and Edmonton, Alta.; Humboldt, Sask.; Port Arthur, Ont.; Kamsack, Sask.; North Battleford, Sask.

Current Events in Photographs



SIR DAVID BEATTY IS NOW OUT OF WORK

It must seem rather strange for Admiral Beatty, after nearly five years of ceaseless night and day patrolling of the Atlantic to find himself out of a job. In the photo he is shown entering St. George's Hall at Liverpool with the Lord Mayor who presented him with the freedom of the city. The trim, natty uniform of the great leader of the Navy makes rather a striking contrast with that of the Lord Mayor.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	9 25
Chequered floor plate, ¼ in.	9 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 30
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

Lake copper	$18 50	$18 50
Electro copper	17 50	17 50
Castings, copper	17 00	17 00
Tin	54 00	55 00
Spelter	8 00	8 25
Lead	6 50	7 50
Antimony	8 00	8 50
Aluminum	38 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 4 50
Plates, 3-16 in.	5 50	4 90

Price List No. 38

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$10 50	$10 00
Copper, crucible	13 00	12 75
Copper, heavy	13 00	12 75
Copper wire	13 00	12 75
No. 1 machine composition	10 00	12 00
New brass cuttings	8 00	9 00
Red brass turnings	8 00	8 50
Yellow brass turnings	6 00	6 00
Light brass	5 00	5 00
Medium brass	7 00	6 00
Scrap zinc	4 00	5 00
Heavy lead	3-4	4 00
Tea lead	2-3	3 00
Aluminum	15 00	12 00
	Per Ton	
Heavy melting steel	9 50	9 00
Shell turnings	6 00	6 00
Boiler plate	10 00	8 00
Axles (wrought iron)	20 00	15 00
Rails	15 00	11 00
Malleable scrap	15 00	12 00
No. 1 machine cast iron	17 00	14 00
Pipe wrought	8 00	5 00
Car wheels	20-22	18 00
Steel axles	22 00	20 00
Mach. shop turnings	5 00	5 00
Stove plate	12 00	10 00
Cast boring	8 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	45
Elevator bolts	25
Machine bolts, 7-16 and over	25
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list plus	15
Burrs only, list plus	40
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	75
Wood screws, O. & R., bright	70
Wood screws, flat, brass	40
Wood screws, O. & R., brass	.5
Wood screws, flat, bronze	30
Wood screws, O. & R., bronze	27½

MILLED PRODUCTS

	Per Cent
Set screws	25
Sq. and Hex. Head Cap Screws	20
Rd. and Fil. Head Cap Screws	net
Flat But. Hd. Cap Screws	plue net
Fin. and Semi-fin. nuts up to 1 in.	25
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add 7 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	35
S.S. drills, wire sizes, No. 53 to 80	40
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	40
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 40
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	75
High speed cutters, list plus	40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings. 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	8 00
Can. plates, all bright	8 50	9 00
Apollo brand, 10¾ oz. galvanized		
Queen's Head, 28 B.W.G.		
Fleur-de-Lis, 28 B.W.G.		
Gorbal's Best, No. 28		
Colborne Crown, No. 28		
Premier, No. 28 U.S.		7 95
Premier, 10¾ oz.		8 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅞ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.		45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	**.06**

BRASS

Brass rods, base ½ in. to 1 in. rod	0 38
Brass sheets, 24 gauge and heavier, base	$0 43

WASTE

Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

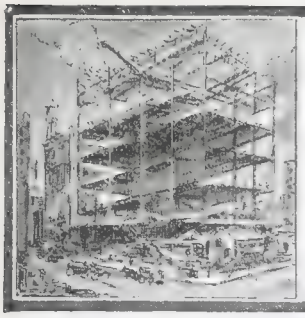
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

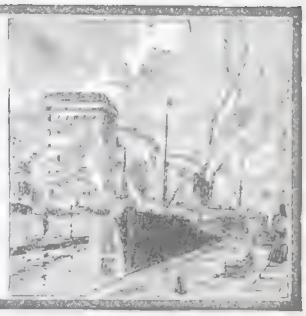
Acid, boracic	$.25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	.
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



ENGINEERING

Ottawa.—Canada's new Parliament Buildings will cost at least eight million dollars, and may cost ten millions, announced Hon. Frank Carvell, Minister of Public Works, in the House of Commons. The original estimate of the cost of replacing the handsome pile that fell a prey to the flames three years ago was five million dollars. The Government has already expended five millions, and is asking for another two millions to be spent this year, "and then it won't be anywhere near completed," said Mr. Carvell. "I have no hesitation in saying," he added, "that when the building is completed it will have cost eight million dollars." The Minister explained that the excess cost over the estimate was due to the sensational advance in the prices of building material. He frankly told the House "what I have already told the builders: that we have not got value for the money expended. The workmen seem to think it is good, easy Government money and that they should not be in a hurry about finishing the job."

TRADE GOSSIP

Montreal. — Plans are being prepared by a firm of New York architects, for the construction of a factory in this city, at an estimated cost of $250,000. The plant will be used by the Republic Motor Co., Ltd., of Detroit, Mich.

Walkerville. — The ground for the new buildings of the General Motors Corporation has been broken. The entire plant will cost $26,000,000, and the company plans the erection of two buildings this year.

The Cooper-Hewitt Electric Company, Hoboken, N.J., have issued an attractive calendar well illustrated with half-tone engravings showing installations of their lighting systems. This calendar shows installations in various classes of manufacturing establishments from machine shops to textile mills.

Guelph. — The students and staff, old boys and friends of the Ontario Agricultural College, have decided to erect an assembly hall in memory of the boys who fell in action during the great war. A committee has been formed, of which Dr. Creelman has been appointed chairman. The estimated cost will be $100,000.

Montreal. — The requirement of a bond covering all credit accounts for shippers and consignees of freight has been cancelled. The new credit rules call for the settling of charges accumulating from the 1st to 7th of the month by the 14th; from the 8th to the 14th must be paid by the 21st; from the 15th to the 21st must be paid by the 28th and so on. The bonding feature was cancelled because the majority of shippers objected to it.

Montreal. — The directors of Armstrong Whitworth Ltd., as elected at the annual general meeting held here recently are as follows: president, Sir E. P. C. Girouard, K.C., MG.; vice-president, M. J. Butler, C.M.G; directors: Right Hon. Sir Geo. H. Murray, G.C.B.; Hon. Geo. G. Foster, K.C.; F. B. T. Trevelyan; H. B. Walker; H. H. Vaughan, Lawrence Russell The executive committee in charge of the company's works in Canada will be M. J. Butler, H. H. Vaughan and Lawrence Russell.

New Companies.—Joint stock companies have been incorporated this week as follows: The Dixon Co., Peterboro, capital $1,000,000; Dupuis Freres, Montreal, $2,500,000; France and Canadian Steamship Co., Ltd., Montreal, $10,000,000; The Ottawa Iron and Metal Co., Ltd., Ottawa, $50,000; Four Wheeled Drive Auto Co., Ltd., Kitchener, $200,000; Dominion Towing and Wrecking Co., Ltd., Midland, $250,000; W. A. White Co., Ltd., Montreal, $30,000; Central Canada Industries, Ltd., $50,000; The Spedolene Refining and Mfg. Co., Ltd., Montreal, $50,000; Maple Leaf Mfg. Co., Ltd., Montreal, $500,000; Ledoux-Jennings, Ltd., Montreal, $250,000; H. & A. Saunders, Ltd., Toronto, $100,000; Canadian Western Steel Corporation, Ltd., Calgary, $2,000,000; Regent Metal Goods, Ltd., Montreal, $75,000; Vapor Car Heating Co., of Canada, Ltd., Montreal, $122,000; Corundum, Ltd. Ottawa, $250,000; Mutual Finance Corporation, Ltd., Windsor, $300,000

New Industry.—One of the latest industries to locate in Sarnia, Ont., is the H. H. Robertson Co., Limited, manufacturers of asbestos-protected metal. Their product is used as roofing and siding in industrial plants of all kinds. Its body or core is a special annealed solid sheet of steel, immersed in a bath of asphaltic compound to protect against corrosion, and this is insulated with pure asbestos felt forced into the asphalt under pressure. The final covering is an original process of waterproofing which gives a tough, smooth, repellent surface. Asbestos-protected metal has been marketed for some time in the United States by the Aspromet Co. of Pittsburgh. It has been widely used as roofing and siding in foundries, forge shops, mill buildings, storage houses, acid chambers, chemical plants, pumping stations, protection for expensive electric equipment and for a wide range of other purposes. It answers the problems of maintenance and depreciation which are so great a factor in expensive construction. The Sarnia Company will also manufacture troughing, spouting, ventilators, etc., for complete building construction.

Locate in Hamilton.—The Hoover Suction Sweeper Company of North Canton, Ohio, has decided to establish its Canadian headquarters in Hamilton, and will erect a large plant there. Negotiations have been in progress for the past few months, and Mr. Kirkpatrick, the industrial commissioner, landed the industrial prize after stiff competition with London, Windsor and other cities. Heretofore the Hoover Company has had a small manufacturing plant at Windsor, from which point its Canadian business has been handled, but this will at once be moved to Hamilton, and as the company now plans to go after Canadian and export business aggressively, it is the intention to erect a big modern plant at once. In fact, the Canadian general and sales offices have already been moved to Hamilton, temporary quarters having been secured at 20 Macnab street south, to be used while their permanent manufacturing plant and offices are being erected in the east end of the city. A site with a street frontage of about 600 feet, at the corner of Gage and First avenues, has been purchased, and within a few days work will be started on a series of model factory buildings, which will be the last word in industrial construction and an ornament to the district in which they are located

TENDERS

John Labatt, Ltd., London, Ont., are calling for tenders for the purchase, including wrecking and removal, of water tower motor tank 90 feet steel supports, containing 10,000 wine gallons.

The Canadian National Railways are calling for tenders, up till May 26th, for an addition to the freight car shops. Plans and specifications can be seen at the office of the architect, J. Schofield, Winnipeg.

Tenders for fire apparatus for the Toronto Fire Brigade will be received up till noon, May 27, for the following: 55 foot city service gasoline combination ladder truck with tiller; 75 foot aerial

ladder truck, front chain drive, with tiller, gasoline driven; automobile triple combination pumping engine hose and chemical wagons, pumping capacity 80/ Imperial gallons. T. L. Church, mayor.

INCORPORATIONS

The Measuregraph Company of Canada, Ltd., has been incorporated with a capital of $2,500, divided into 25 shares of $100 each, to manufacture and sell instruments for measuring fabrics, textiles, etc.

The Central Canada Industries, Ltd., has been incorporated with a capital of $350,000, divided into shares of one hundred dollars each, to develop lands, industries, banking business, etc. The head office is in Toronto.

The Four Wheel Drive Auto Company, Ltd., has been incorporated with a capital of $200,000, divided into 2,000 shares of $100 each, with head office at Kitchener. The company's charter covers all ends of the automobile business.

A company has been organized at Calgary, with a capital stock of $2,000,000, to be known as the Western Canada Steel Corporation. The shares will be divided into 20,000 of $100 each, to carry on the business of steel manufacturers.

The Dominion Towing and Wrecking Company, of Midland, has been incorporated with a capital stock of $250,000, divided into 2,500 shares of $100 each, to carry on a general wrecking and towing business.

The Welland Utility Manufacturing Company, Ltd., has been incorporated with a capital stock of $250,000, divided into 2,500 shares of $100 each, with the chief place of business in Welland. The company is authorized to manufacture, import, sell, etc., electrical appliances, machinery and instruments of all kinds pertaining to electrical work.

William Arthur White, Joseph Armitage Ewing, K.C., and George Samuel McFadden, K.C., and John Travers Smith, clerk, of Montreal, and Wilfred Clare White, Westmount, have been incorporated under the title of W. A. White Company, Limited, with a capital stock of $30,000, in 300 shares of $100 each, as manufacturers of rubber goods.

MARINE

Quebec.—The steamer "War Toronto," which went ashore on her passage to Quebec, has been refloated, after a few days on the ground. After being pulled off she proceeded to Quebec under her own steam.

Watertown, N. Y. — The excursion fleet on the St. Lawrence and among the Thousand Islands, will be limited again this year, despite the end of the war. The Canada Steamship Lines have announced that the service will be the same as that of last year. Connections between Clayton and Alexandria Bay will be maintained by the Island Belle and Riverside, passing through the famous American channel between Clayton and the Bay.

St. John, N. B.—The winter season just ended has been a record one. The amount of wheat shipped during the winter was 19,956,000 bushels. The season was opened on November 23 last, by R.M.S. Tunisian, which loaded in St. John, after bringing over troop dependents and civilian passengers. She was the first of a total of 222 ocean going freight steamers. Nearly 25,000 returning troops have been welcomed at the port, and as the Board of Trade Journal proudly states, "The port of St. John was never closed an hour during the war."

Montreal. — The coming visit of Col. Grant Morden, the organizer of the present combination of steamships, has given rise to talk of a gigantic merger of British and Canadian steamship interests. The Canadian steamers would be of use as feeders on the inland waterways. Col. Morden is a member of the Canada Steamships London executive, and is understood to represent the London interests who advocated a higher dividend on the common stock than the four per cent. recently inaugurated .

Toronto.—The "Cayuga" will open the Toronto-Niagara season when she makes her first trip to Niagara on the 17th of this month. The Canada Steamship Lines announce that the regular two-boat service will not start until June 14, when the "Chippewa" will also be placed on the run. The "Kingston" and "Toronto" will open the Thousand Islands run on June 14, running on Mondays, Tuesdays and Saturdays to the end of the month, when the daily service will start. During the war the tourist traffic on this route was poor, but is expected to pick up this summer.

Sydney, N.S.—The prospects for the St. Lawrence coal trade are not bright, according to officials of the Dominion Steel Corporation. Three vessels having a tonnage of 45,000 which are owned by the Dominion Coal Company, are now employed by the British Government in transporting grain from Australia to England, while, according to report, Canadian grain elevators are filled to overflowing. One vessel is used as a transport between the United States and England and England and Italy, while another vessel has been carrying cargoes from South America to Holland for the Dutch Government. The latter vessel will now be most of the summer undergoing repairs.

Ottawa. — The Dominion Government will continue its shipbuilding programme through 1919 and 1920, according to a statement in the House by Mr. C. C. Ballantyne, Minister of Marine and Fisheries. The occasion was the bringing forward of an estimate for $30,000,000 to complete the program already announced. The Minister emphasized the fact that the number of ships that the country could use was limited, and that they were very near the limit now. He said that the number of men now employed in the shipbuilding trades was 46,000, and it would be a dangerous thing for any Government to throw that number of men out of employment. This consideration would influence the Government in placing further orders.

Vancouver. — Speaking before the Mathers Commission in Vancouver recently, J. J. Coughlan, of the Coughlan Ship Yards, gave his opinions of the present troubles and the future outlook of his industry. A heavy handicap against shipbuilding, he said, was the heavy freight rates, and the high cost of labor. The unrest in labor circles he attributed to the fact that many of the Union officials were Socialists, and in some cases violent Socialists. A hopeful feature of this condition, however, was that the Reds were losing prestige in the eyes of the men, because they were going too far in their demands. The presence of a man like Gompers or Peter Wright for a couple of months, would be of great help in improving conditions, in the opinion of Mr. Coughlan.

Ottawa.—Representatives of shipbuilding companies located at various points in Canada from Port Arthur eastwards and of the Shipbuilding and Marine Federation, the shipyards employees' organization, who have been in conference here for several days have, it is understood, reached a basis of understanding on questions at present the subject of negotiation. They have divided into committees which will visit the yards of the various districts to consult employers and employees. One committee will go to Collingwood, Midland and Port Arthur, for instance, and another to Toronto and other points in Central Ontario, where shipyards are operating. The Shipbuilding and Marine Federation, on behalf of the employees, is asking for wage increases and for a forty-four hour week.

Ottawa. — By an order-in-council the Government has made traffic on the canals possible. This does not apply to all canals, and to only a portion of the day to those mentioned. Employees will not be compelled to work on Sunday, but those willing to do so will receive an extra twenty cents per hour. Following are the waterways and hours between which they will be available for Sunday traffic:

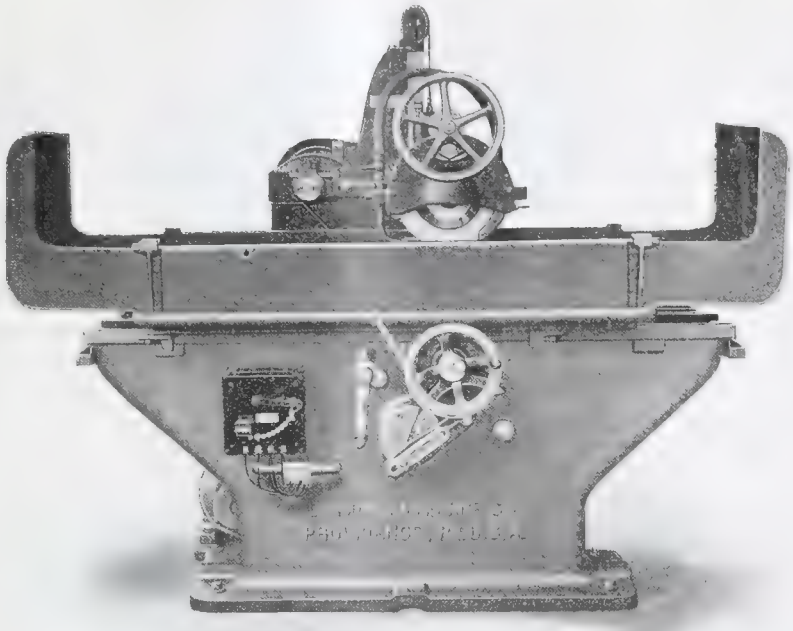
The Ottawa River canals and the Rideau canal, except from Pretoria Ave. bridge, Ottawa, to Manotick, between 6 a.m. and 9 p.m. on Sundays, and between Pretoria Avenue bridge and Manotick, the route to the Rideau lakes, from 5 o'clock to 10 each Sunday morning, and from 2 p.m. on.

On the Trent canal locks No. 7 at Glen Ross, No. 18 at Hastings, No. 19 at Peterboro, No. 27 at Young's Point, No. 32 at Bobcaygeon, No. 35 at Rosedale, Lindsay lock, Port Severn lock, and the Marine Railways at Big Chute and Swift Rapids, together with the associated bridges, from 7 o'clock to 11 on Sunday mornings, and from 5 to 9 o'clock in the evenings.

BOOK REVIEWS

The Electric Furnace Co., Alliance, Ohio, have issued booklet 5-B, dealing with the use of the Baily Electric Fur-

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DIAMOND

No. 1 Automatic Wet Surface Grinder

SPECIFICATIONS:

Table Surface.....24" x 12"
Takes wheels to..12" x 1½"
Speed constant..1633 RPM
Table speeds...18, 30½, 43
Auto cross feed (variable) .005" to 3/32"
Net weight.....3800 lbs.

Investigate the Production Possibilites of this Grinder —Now.

The A. R. Williams Machinery Co., Limited

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Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

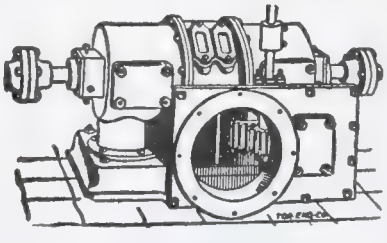
up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

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BELLEVILLE, ONTARIO

nace for melting non-ferrous metals. These furnaces are all of the resistance type and through the use of the carbon resistor very advantageous results are obtained, resulting in minimum loss of volatile metals, such as zinc. Results are obtained which are superior to those given by the oil-fired furnaces, and at a cheaper cost.

The Woodturner's Handy Book, by P. M. Havlock. Crosby, Lockwood & Sons, publishers, London. Price, 1s. 6d. This publication has been written for the imparting of knowledge on the tools, appliances, and processes used in wood turning. The various tools used in this craft are well described, the methods in use for sending out work and the actual operations in connection with the woodturning all clearly set forth. Typical examples of various classes of work, embracing practically all those commonly encountered, are given.

The General Industrial Catalogue of TYCOS Instruments containing 422 pages of useful and interesting temperature information is now ready for distribution. This new publictaion describes the whole line of TYCOS instruments for the indicating, recording and control of temperature. Many special applications are illustrated, showing the manner in which TYCOS instruments can be adapted to diverse temperature needs. Practically every instrument manufactured by the Taylor Instrument Companies for industrial purposes is illustrated and much explanatory matter descriptive of their construction and principles of operation is given. The list includes thermometers of every description, index and recording thermometers, hydrometers, pyrometers, temperature and pressure regulators, barometers, absolute pressure and draft gauges. A handsome publication, well bound, printed on paper of excellent quality and illustrated throughout with line drawings and half-tone cuts.

FURNACES STILL BEING BLOWN OUT

Dullness still characterizes the pig iron market. While enquiries for the most part are still very light, prices are holding fairly well, and in one case have advanced. The result of official negotiations is being waited for.

Following are the reports from various U.S. points:

NEW YORK.—The market is experiencing a very fair demand, and some iron has been sold for export. One lot of 100 tons has been sold to Holland for the full price of $45, at the furnace, and 250 tons No. 2 x at $28.25 furnace, which is equivalent to $32.55 New York. Low phosphorus iron is holding well, with a better outlook. A sale of No. 2 x for delivery over last half, amounting to 500 tons, has been made by a Western dealer at $28.50 Pittsburgh, which is equivalent to $32.80 New York.

PHILADELPHIA.—The quotations on the market here are varying widely, with the tendency towards lower prices. In some cases makers who have sold at the full Pittsburgh basis are agreeing to give purchasers the benefit of any reduction that may be made after the conference. Basic is in little demand, consumers apparently being well provided for. A further reduction in the number of stacks working is expected soon.

PITTSBURGH.—There is little business moving in pig iron in this district. Quite a few sales of carload lots are being made, but no quantities. Production is still being reduced, and last week the Cambria Steel Company blew out another furnace, and the Alice furnace of the Valley Mould and Iron Corporation was blown out. Total production in this district is not above 40 per cent. capacity.

BUFFALO.—With furnaces operating at 50 to 60 per cent. capacity, prices are holding firm. Little business is being done, the aggregate being under 1,000 tons for the week.

CLEVELAND. — The quietest week since the beginning of the year is the verdict on the past week's business. Makers think that this is due to hesitancy on the part of buyers who are waiting for the result of the Government's price adjustments.

CHICAGO. — The necessity of some consumers to obtain small quantities of pig iron to help out their mixtures has resulted in the sale of a few carload lots. Some shading of prices has occurred on sales of small lots to Southern interests, amounting to from $2 to $4 a ton.

CINCINNATI.—Southern prices are holding firm, nothing having occurred to affect quotations during the week. Enquiries are few and sales fewer.

BIRMINGHAM. — One furnace has been blown in during the week. There is no movement in the market, and while there is talk of readjustment, no method has been proposed. What sales there are are on a carload lot scale.

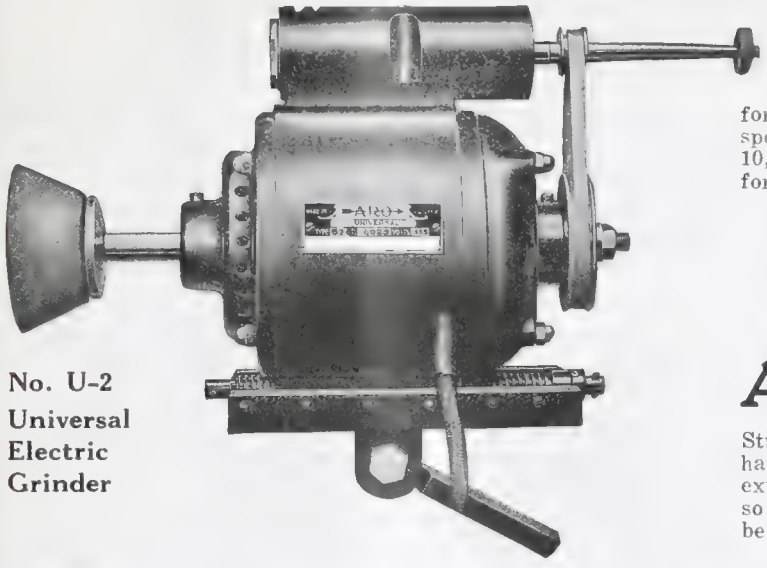
ST. LOUIS.—The week has seen no sales of pig iron. Not very much is expected from Washington in the way of help, and an open market is the only hope of a return to normal. The starting up of some large building operations will call for large tonnages of iron and steel, the new plant of the General Motors Co. alone costing over $4,000,000.

The aim of the fireman should be to keep his fires bright, and to have the combustion go on so that carbon monoxide and smoke shall be kept down to a minimum, and so that carbon dioxide shall be present in the flue gases in a proper proportion. The only practicable way to accomplish this, in small plants, is by employing firemen who understand their business thoroughly, and who know by the appearance and behavior of a fire whether it is working properly or not. For larger plants, where a greater expenditure of time and money is permissible for securing economy, various forms of carbon dioxide meters have been devised for showing the percentage of this gas that is passing away through the flues. Some of them are good, and well worth using; but they must be handled by men of a higher grade than are ordinarily intrusted with the duties of the fire-room. Complete flue-gas analyses are also quite helpful in maintaining high efficiency of combustion, but these can be made only by men who have some knowledge of chemistry. In plants where large quantities of coal are burned, it will usually pay to keep a record of the percentage of carbon dioxide that is passing away through the flues. By varying the method of firing a little, and studying the effect of the changes upon this percentage, it is often possible to improve the fire-room practice in a considerable measure.

EFFICIENCY IN BELT DRIVES

By D. Street

In almost every factory and machine shop a certain amount of power is wasted in transmission through driving belts, the percentage of loss depending on the attention paid to the matter. Slipping, the trouble most frequently encountered, is common to all classes of belting, and generally speaking the remedy applied is to cut and tighten, or "take up" the belt so that it will run free from slackness with a better grip of the pulley; but probably more belts are broken and prematurely destroyed in this way than by actual use, not to speak of the additional load thrown on the engine and the consequent waste of power. To overcome slipping, many engineers incline to the principle of using belts wider than is actually necessary. This permits a heavier load to be carried, but when the practice is generally adopted all over a machine shop with fifty or more belt There is, however, a growing tendency to run belts slack, as not only is friction thus reduced and the life of the belt increased, but no power is wasted and the strain on the prime mover is considerably reduced. Immediately the tension is reduced the friction is proportionately lessened. Further increase of the arc of contact round the pulley (after the belt has been sufficiently slackened to have no initial tension) will not lessen the friction, but the load-carrying capacity of the belt is increased. As an example in many engineering shops it has been found that cuts 50 per cent. heavier can be taken on lathes where the arc of contact has been increased from 180 deg. (with a tight belt) to as high as 220 deg. (with a slack belt) and in one instance with a corn-crushing machine the increase in output was over 50 per cent. To permit of driving belts being run slack a proper belt dressing should be employed. Many belt dressings rely almost entirely on their capacity to "stick," due to the inclusion of rosin or tar in their composition, but others take the form of a non-sticky preservative or belt food free from acid or alkali action, which is absorbed into the belt, rendering it pliable and highly effective, and at the same time protecting it from the effects of moisture, dryness, or chemical fumes. Such a preparation properly applied tends to give belts a velvety cling through the setting up of a vacuum suction between the belt and the pulley face, and will permit of slack running without fear of slip, even under the heaviest loads.



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Wheels Cut Accurately and Very Fast

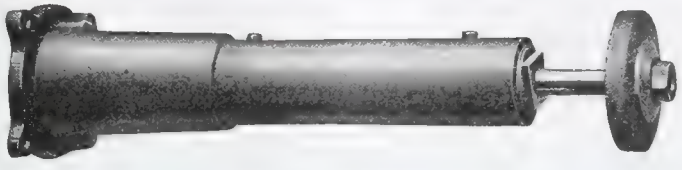
for there is neither vibration nor end play. The speed of the main shaft for external grinding is 10,000 R.P.M. The speed of "A" arm attachment for small internal grinding is 30,000 R.P.M.

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Aro Grinders

Strong, dynamic-balanced machine capable of handling with ease tool and die work. The "Aro" extension arm attaches direct to armature and so travels at the same speed 10,000 R.P.M. Can be supplied 5, 10, 15 and 20" long.

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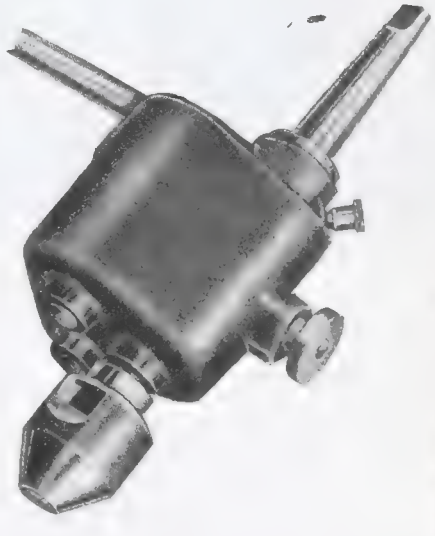
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Machine Tapping With the Oscillating Movement

There can be no argument in favor of hand-tapping once you have become acquainted with

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It has the oscillating movement which mechanically imitates hand-tapping, though **10 times faster** and reduces tap breakage to the very minimum.

With the Walstrom attachment you can tap holes as squarely as they can be drilled.

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Technical Education Plus Horse-Sense

By ROBERT MAWSON

I read with much interest the letter which J. H. Harrison wrote, on page 395, in reply to my short article in the issue of March 27th.

Let me say, however, in the first place that I was not attempting to criticize machine designers—that would be folly.

A machine designer in my estimation is a man, up to the minute in ideas and at all times ready to absorb knowledge that will help him to design better, no matter where the information comes from.

Let me say this for the three examples which I mentioned to illustrate the point in my article, in each case the design was fabricated by a man considered to be a designer—not a tracer.

Each man had received a college education and graduated from mechanical engineering classes, and knew the theoretical side of the profession.

The viewpoint I take is, that before a man can perform the work of machine-designing to advantage and sensibly, he must use not only the theory he has obtained, either at college or by study, and add to it what I called "horse sense."

I agree with Mr. Harrison, that the lathe I mentioned was not good design, but the fact remains that it was designed, and that by a man who called himself a machine-tool designer.

This case, however, was taken simply to illustrate my point, and that is why it is first of all foolish for a man to assume he knows everything because he has graduated from college and can figure out stresses, strains and the like. The graduating from college is merely the beginning of an education.

The knowledge gained there places the man's mind in a receptive mood for practical knowledge, which can be incorporated with the theory he has already received.

But to gain this practical knowledge he must get out amongst the things being made and gather information from the people doing these things. He may be asked many foolish questions, but he can sift out the ideas worth while and forget the others.

Again, Mr. Harrison says later in his article, "That a designer must have a good working knowledge of the methods and practices employed in the shop."

This is true, and the manner in which this knowledge has been obtained is by taking the technical knowledge he already had, and adding practical shop experience, and then using "horse sense" in his designs. Many elements used on machines are much stronger than any stresses to which they are placed call for, but they are so made because the human unknown factor enters into their use. Take as one example the equalizing levers for the brakes on an automobile. These are made abnormally strong; stress caused by either tension or compression does not enter into the question. The only way these can be designed is to forget theory and use what I have called "horse sense," and the only way this can be secured is to get down to the practical end of the profession.

And this same truth is evident all along the line.

There may be examples where the opinion of the executives in the shop are at fault, but in every case the designer will profit by asking for their advice.

If, after receiving it, he then considers it to be wrong—after due consideration—he has not lost anything by the interview, but rather tends to gain, as his certainty of the subject is strengthened.

This viewpoint is given, not as theory, but from actual experience—I have worked on both sides of the fence, the designing department and manufacturing end.

The big men in the game are those who are ready to listen to any advice given, no matter where the source may be, and use such portion as will broaden them in the engineering profession.

To illustrate this with only one example—one of the best engineers I ever met, a man of world-wide renown, made a practice of going through the various departments of the shop every morning and asking how the men found things in general, could they think of anything that they considered not right, either in design or manufacturing methods.

Many foolish remarks were made, of course, but some were worth consideration, and this engineer acted upon them and everybody in the plant received the benefit.

To sum up the matter, theory is good if incorporated with practical knowledge; separate the two and there is a state of chaos. Get all the theory you can, add to it practical knowledge; know why certain things are done, not only how to do them, use a little "horse sense" in doing them, even if it knocks your theoretical, book training into a cocked hat, and you will be a designer. With such an education, gained either up through the shop to the office, or up from the office to the machine shop, mistakes such as I recorded will be impossible, and designs made will look right, operate correctly, and be a credit to you. In conclusion, let me add that I do not blame the designer, I only wish to show him the mistakes of others, and how he can avoid them by obtaining the correct experience from the proper source.

HARDNESS AND WEAR

Hardness is a metallic quality which practically defies definition; anyhow, recent attempts to define it are, to say the least of it, disappointing. Unusual cases of wear always provide interest to the engineer, and have a bearing on the subject; most often alteration in the material of one member provides a remedy.

In a milling machine of good U. S. A. type there was a worm and wheel meshing. A few days in service found trouble; examination showed that both worm and wheel had the tried and worn appearance as if abrasive had been used for lubricant, the teeth of the wheel were over one-third worn away and the worm itself scored.

The cause—steel worm and steel worm wheel both unhardened; the wheel was replaced by one of cast iron, and gave no subsequent trouble.

In another instance a hand-actuated toggle press of simple type to stretch pieces of solid drawn tube to a shape unobtainable commercially was designed; at all events, although quotations were invited in several likely quarters, none were received, the quantity was moderate, and probably would not pay for special tools and usual drawing methods. Whatever the reason, it was decided to have the job home-made, and a simple toggle drawing press was made up from available material. The screw was fixed at 1¾ in. diameter, for the reason that the shop possessed a pair of R. and L. square thread taps of that size, which were dug out from obscurity; and were a veritable find. The smith was commissioned to make two nuts and blank for threading, and no one gave a thought to material. The smith made screw blank nuts from the same steel bar. It took exactly twelve hours' work to produce fine steel powder, visible on screw and exterior of nut, and lubrication had no effect whatever, while turning the handle became a matter of horsepower. The job was dissembled, the screw cleaned up, and two gun-metal nuts obtained from a local foundry to a hastily made rough pattern. The job never gave trouble after, and the press used for occasional jobs has screw and nut threads in perfect condition after a lapse of years. The question of wear is not altogether one of hardness, M. steel and cast iron work perfectly together as a wearing surface, so also do the usual babbitt and bronze: but a mild steel shaft will not work with a mild steel bearing—try it and see. The shaft will cut and score, while if the pressure is considerable, as in a worm or pressure screw, the freezing qualities of the similar material in contact merely emphasizes the matter. Lubricant has literally no affect whatever; it is merely a vehicle to float away the disintegrated particles of steel as they are produced. Two pieces of steel glass, hard and perfectly polished, might slide for years, but such an instance is, to say the least

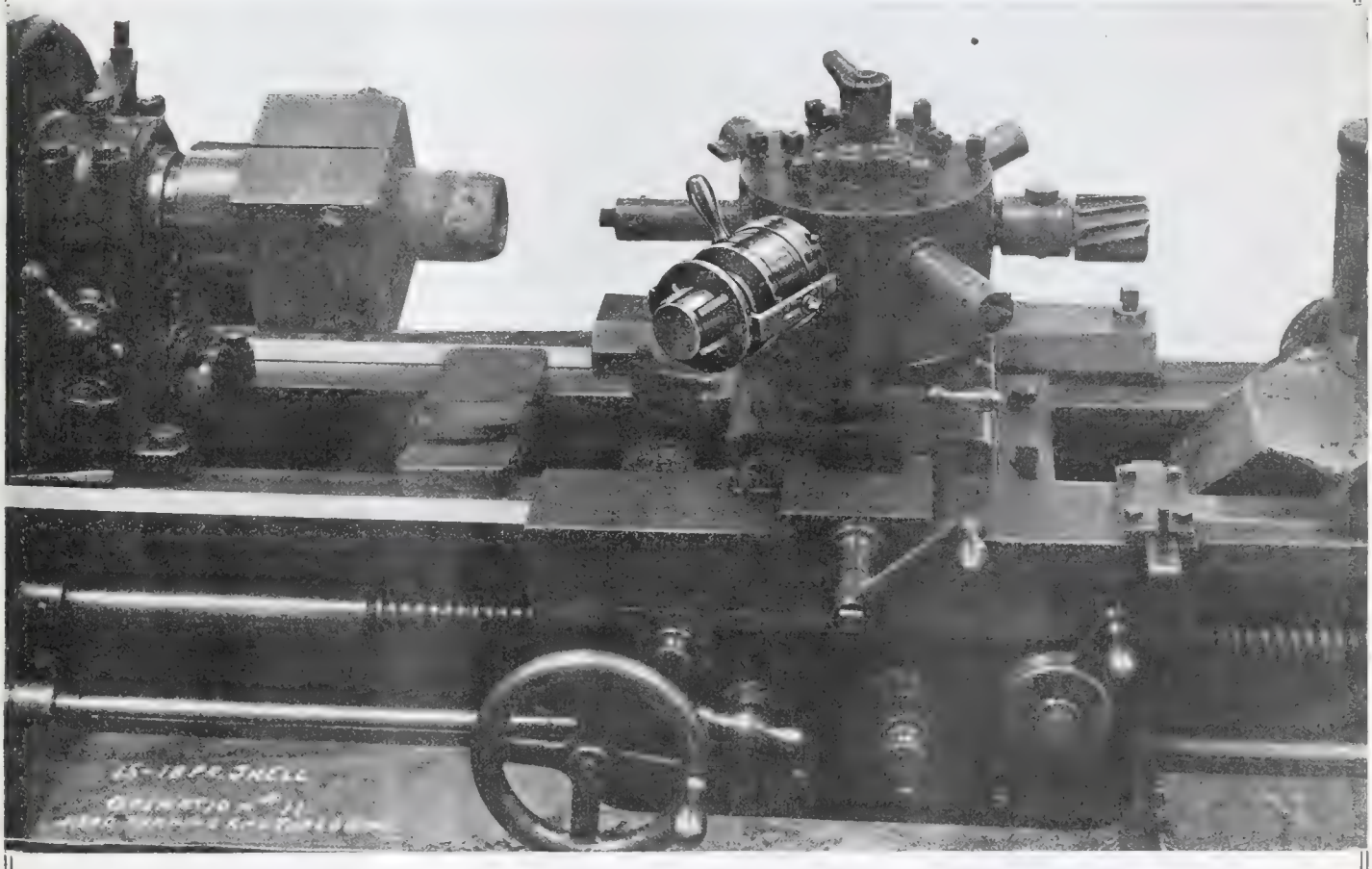
ANOTHER GEOMETRIC FEAT

DESCRIBED IN A LETTER FROM CANADA

Messrs. Geometric Tool Company,
New Haven, Conn., U.S.A.

Gentlemen:—

"The engine lathe shown in the photograph which we are sending you commenced work on shells within four months of the start of the war, when methods were in course of development, and special machines were unknown. Material and labor were both frequently unsatisfactory. Rejections due to poor threads were



frequent troubles with shell makers. Despite many adverse conditions the contract was successfully completed, and the Geometric Tap used on this lathe (fitted to cross-slide on carriage) was an important contributing factor in the good work done in the early strenuous times."

Very truly yours,

Whether yours is a tapping or threading job, or both, you would be satisfied with the Geometric way of doing it.

The Geometric Tool Company, New Haven, Conn., U.S.A.

Williams & Wilson, Ltd., Montreal.

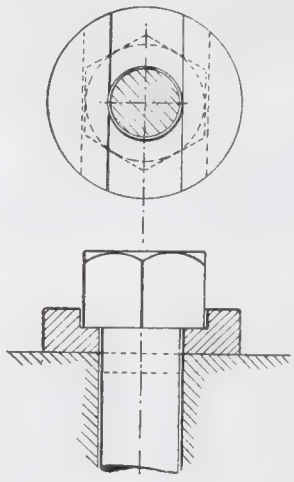
CANADIAN AGENTS:
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

of it, unusual in mechanical matter. Cast iron, as a wearing surface, is a puzzle. In engine cylinders, worn to a glassy surface, there are minute pin-holes, and a close examination shows that the harder points in the structure stand in relief. The essential beauty of cast iron as a wearing surface is the glaze or surface it acquires after running in under proper treatment. If from any cause the glazed surface, becomes abraded the cast iron wears with great rapidity, scores and cuts up in a remarkable manner. Whether the material actually has a surface flow and gets an increased skin tension analogous to that produced in a fluid when solvent substances are introduced it is impossible to say, although theories to explain the facts are numerous enough.

The glazing property of cast iron is not without drawbacks. Possibly the largest single surfaces exposed to running wear in cast iron are those in the reciprocating marine engine. Guides, slide valves and cylinder surfaces are all of considerable size, and the glazing is very marked. Cast iron is by no means the hardest of known substances, but its resistance to abrasive wear places it in the forefront of substances used by the engineer for wear resisting. This lends interest to the subject of hardness versus abrasion.

The glaze on cast iron after prolonged wear is extremely hard; in fact, on a large slide valve it can hardly be touched by a file under all the pressure a man can exert to make the implement bite.

When a large slide valve on a marine engine gets into this condition, efficient lubrication becomes difficult; at all events, there is a decided tendency for the valve to squeak, and the trembling of the eccentric rods show that it is difficult to propel. Usually high flash cylinder oil in quantity fed by a mechanical lubricator will not effect a cure. The only remedy is to break up the surface of the valve at the earliest opportunity, and every marine engineer is aware of the necessity and deplores the hard work involved. The breaking of the skin on the valve with coarse block files does the trick, while the seating is very rarely touched, except that at long intervals it becomes necessary to remachine both valve and coat. It appears, therefore, that under conditions of large area and considerable pressure with the temperature usual to steam practice, that the skin of machined cast iron undergoes a molecular change, beneficial up to a certain point and then detrimental to running. The same remarks apply to the large guide surfaces and crosshead slippers.



SPECIAL WASHERS FOR ADAPTING BOLTS TO PLAIN SLOTS

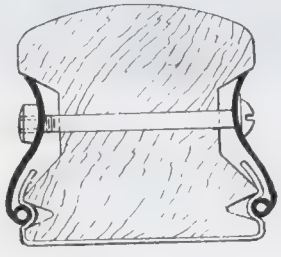
WHEN plain hexagon or square-headed bolts have to be used in the plain slots of drilling or other machine tables, there is no provision for preventing their rotation while the nut is tightened or loosened. But by making special washers, see the sketch, turning can be prevented. On one face the washer is milled out (or cast) with a groove to match the sides of the bolt head; on the other face portions are cut down so as to leave two tongues on either side of the hole, these fitting in the table slot.—FRED. HORNER.

BANKING FIRES

When the boilers are to be put out of service for a short time, but are nevertheless to be kept hot and ready to be restored to use within a few hours, it is customary to "bank" the fires instead of drawing them or allowing them to burn out. The operation of "banking" consists in disposing of the fires so that they will cease to burn actively, the combustion being reduced to the lowest limit that is compatible with the maintenance of the ignition. In this way unnecessary and wasteful loss of fuel is avoided, while at the same time a large body of intensely hot coal is maintained in a condition that makes it possible to start up the fire again very easily, and with little loss of time or material.

Fires that are to be banked should first be well cleaned, and a supply of fresh coal should be thrown upon the grates and allowed to become well ignited. The dampers should next be nearly closed, and the fires pushed back against the bridge wall so as to leave the front part of the grates bare. The fires should then be entirely covered with a considerable supply of fresh coal, the front part of the grates being still left bare, however, so that any air that enters the ash-pit may pass up into the furnace freely, and over the deadened fire instead of through it. Some firemen haul the fire forward, and bank it in a windrow across the front of the furnace. It will keep best if covered with fine, damp coal, well tamped down; for a crust then forms over it which excludes the air so effectively that the fire will often remain alive for two or three days.

Coal-gas is slowly distilled off from a banked fire, and to guard against accident from the ignition of explosive mixtures of gas and air in the furnace and the passages connected with it, care should be taken to ensure sufficient ventilation of the furnace and its connections by permitting a small quantity of air to stream continuously up through these spaces and out into the stack. The ash-pit doors should be closed tightly, and the damper in the uptake of the boiler should be as nearly closed as is compatible with the maintenance of the ventilation to which we have just referred



EMERY-CLOTH BLOCK

A NEAT mode of securing a strip of emery-cloth on a polishing block or stick is illustrated in the transverse section, the object being to use the minimum width of paper or cloth (to save wasted edges) and keep it strained tightly along the bottom of the block. A vee-groove is cut in the edge of each side of the block, and the cloth is pulled into each groove and wedged tightly by the curled ends of spring clamps, drawn together by a screw or screws passing through as shown.—Fred. Horner.



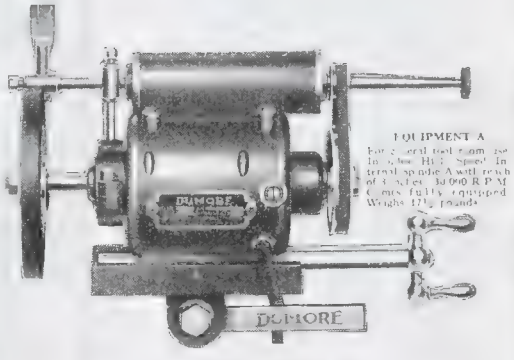
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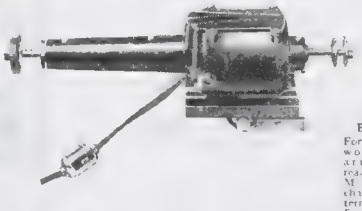
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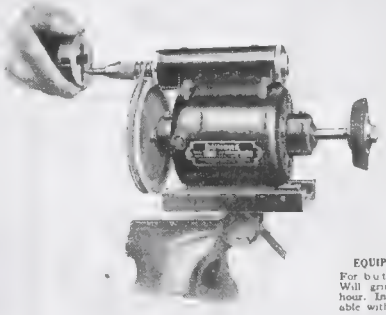
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THE PRODUCTION OF FINE-SKINNED CASTINGS

IN cases where castings are to be machined, a somewhat open and coarse skin, which cuts easily, is preferable, and in the production of this rather open sand and ordinary blacking works bests, owing to the metal usually being clean and free from pinholes just under the skin. This is wanted in bright work, so that waste of time and labor should be avoided, but it is doubtful whether strength is affected appreciably by the occlusion of the air or gases which cause the pinholes, the impervious character of the surface of the mould largely causing their occurrence. In cases where machining has to be avoided, it is necessary to have a fine, close skin on castings of all sorts, and as this largely depends on the face of the mould, it is necessary to, as far as possible, produce moulds that will give the desired results. In fact, it is possible with a pattern where the grain has lifted or been raised by damp and use, to make moulds showing the grain of the wood, so that this feature is repeated in the casting, but usually this is going too far for ordinary practice.

The fineness of the outside of a casting depends very largely on the grade of sand used for facing the moulds, and usually it is well to prepare a stock sand as follows: The new sand is thoroughly dried, and if there is a mill, well ground, and then the finer parts are taken out through a 32-mesh—or finer—gauge sieve, the rejections being again ground and sieved to obtain as much as possible of the sand. This alone is used for all but iron, but for iron facings ordinary floor sand should be similarly prepared, and kept in a separate bin for use as required.

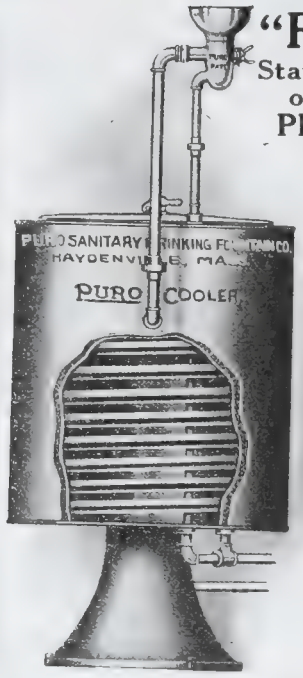
For facings for brass and the like, a proportion of pea flour is intimately mixed with the fine new sand while in a dry state, the amount varying from a pint to a quart of flour to the peck of dry sand, according to its character, and enough is damped down over night for each day's work, being rubbed "tough," as the moulders term it, on the morning of use.

For facing moulds for iron, part new sand and part floor sand is mixed together, according to the character of the new sand, and to this from 10 to 15 per cent. of ground coal, as fine as the sand, is added, the whole being very thoroughly mixed dry, and then wetted, and worked up tough by treading and beating on a clean floor, usually about three parts of new and one of floor sand being about right. This should be prepared at least one day prior to using, but, as it does not alter in storage, it can be made up in bulk at convenient times.

As only a facing of less than ½-in. in thickness is used, and the flasks filled with the ordinary sand, there is no very large quantity of the prepared facing needed, and although its preparation occupies some amount of time as a matter of course, the cost for each mould is very small, and would scarcely be felt in the ordinary costs of the year's working.

Beyond the facing sand, however, a small weight of very finely ground graphite or plumbago is necessary for polishing the surface of the moulds, this material being of good commercial quality, free from additions of clay or other matter. In some cases, also, some finely ground steatite, or French chalk, is necessary, as the plumbago would be likely to stain some metals and alloys, while as its use is chiefly to mechanically polish the surface of the mould, and the amount used is very small, the best grades can very well be used. As the casting reproduces the surface of the mould very fairly, the smoother the mould the smoother the casting, and vice versa, hence the reason for polishing.

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In use, the facing sand is placed over the pattern, in most cases being sifted on, and when ready for the ordinary sand, a section of half the flask would appear very much, as shown in Fig. 1, if the pattern was on a board for ramming up. From this point the mould would be rammed up with ordinary sand and finished off, the vent wire being freely used, care being taken that it only just touches the facing sand, however. In all cases where facing sand is used, it is scarcely possible to provide too much egress for the gases formed, and in this way the vent wire becomes valuable so long as it removes the gases from the back of the facing sand. If you penetrate the facing sand to any depth or touch the pattern with the vent wire, you secure roughness on the casting, and so nullify all the trouble taken to secure a good mould.

After the first half of the flask is rammed up it should be turned over, and the top surface or "joint" trowelled off and well dusted with the parting sand. More facing sand should be arranged over the pattern, and the flask should be completed, a runner stick being inserted at a convenient point for gating the mould. Venting should be done as well on the top as at the bottom half of the mould, and with the same precautions.

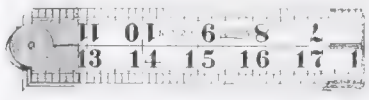
The mould being so far finished, and the runner stick removed, the flask should be opened, and the gates cut, unless it is preferred to do this after the pattern has been lifted. In any case the pattern must be lifted, and the mould finished and cleaned up, after which it should be lightly dusted with plumbago —or steatite—shaken through a cloth, and with a soft camel hair or other similar brush the powder should be polished over the face of the actual mould, any dust being gently blown out with the bellows. The mould should then be closed and poured, a section appearing as shown in Fig. 2.

In some cases surface drying is necessary, but in regard to this individual practice must form the deciding factor, and in such instances smoking the surface of the mould may be adopted instead of using plumbago, the deposited carbon being polished with a soft brush. Smoke from a mineral oil lamp or torch is best for the purpose, a smoky flame being purposely produced.

The gating has to be done carefully, because, on the one hand, it has to be efficient, while, on the other, it has to be as inconspicuous as possible, this, of course, being often a difficult point to arrange. If some part of the casting has to be turned, or otherwise machined, it probably will be possible to gate the mould where this machined part will come, although this is not always feasible, but in all cases the least conspicuous spot must be chosen, consistent, of course, with efficient casting. The dressing of the casting must also aid in this particular item, but, unless on machined work, the gating must be discernible, as the skin of the metal does not cover this.

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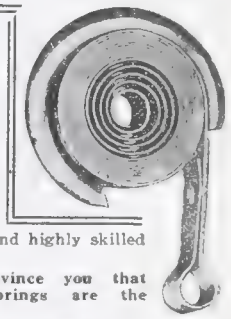
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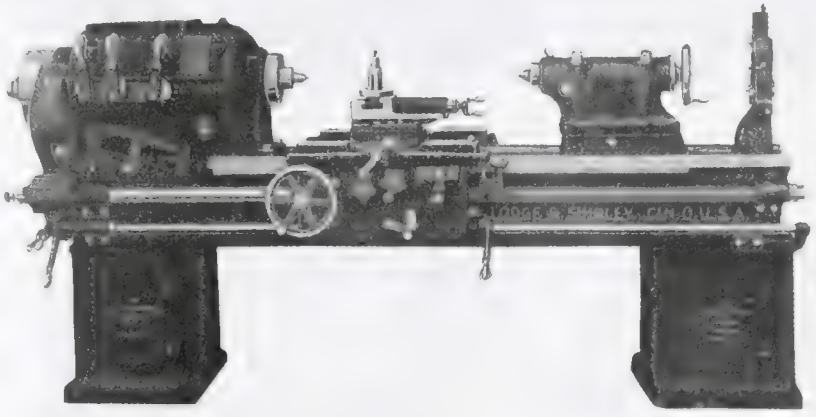
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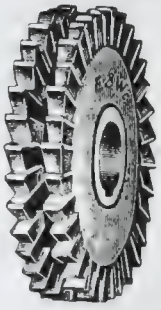
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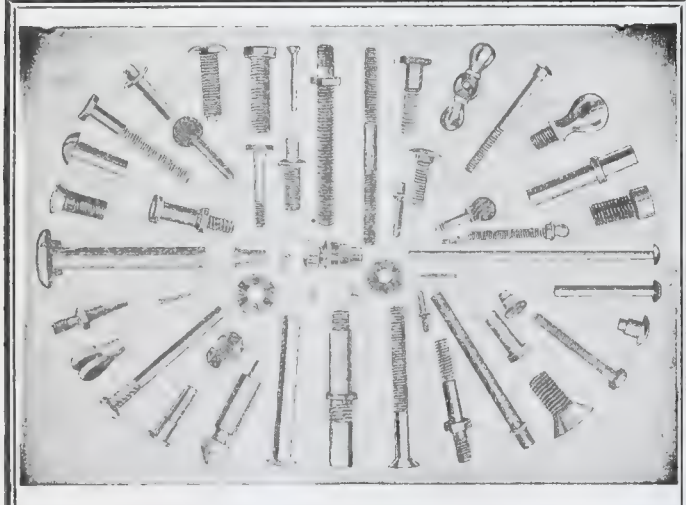


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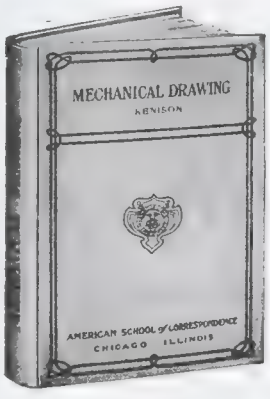
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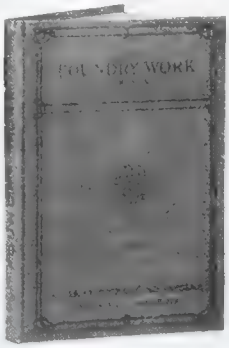
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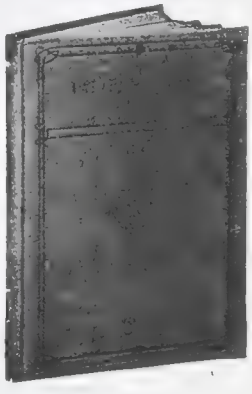
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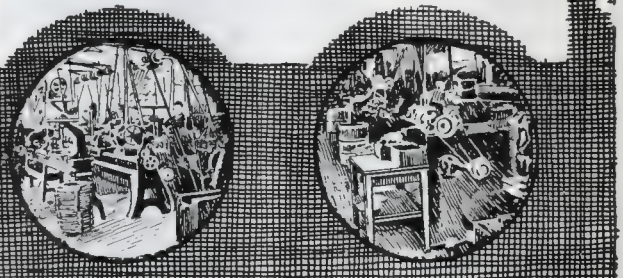
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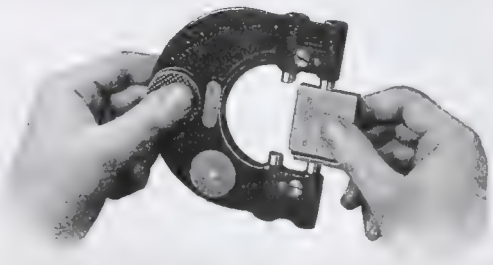
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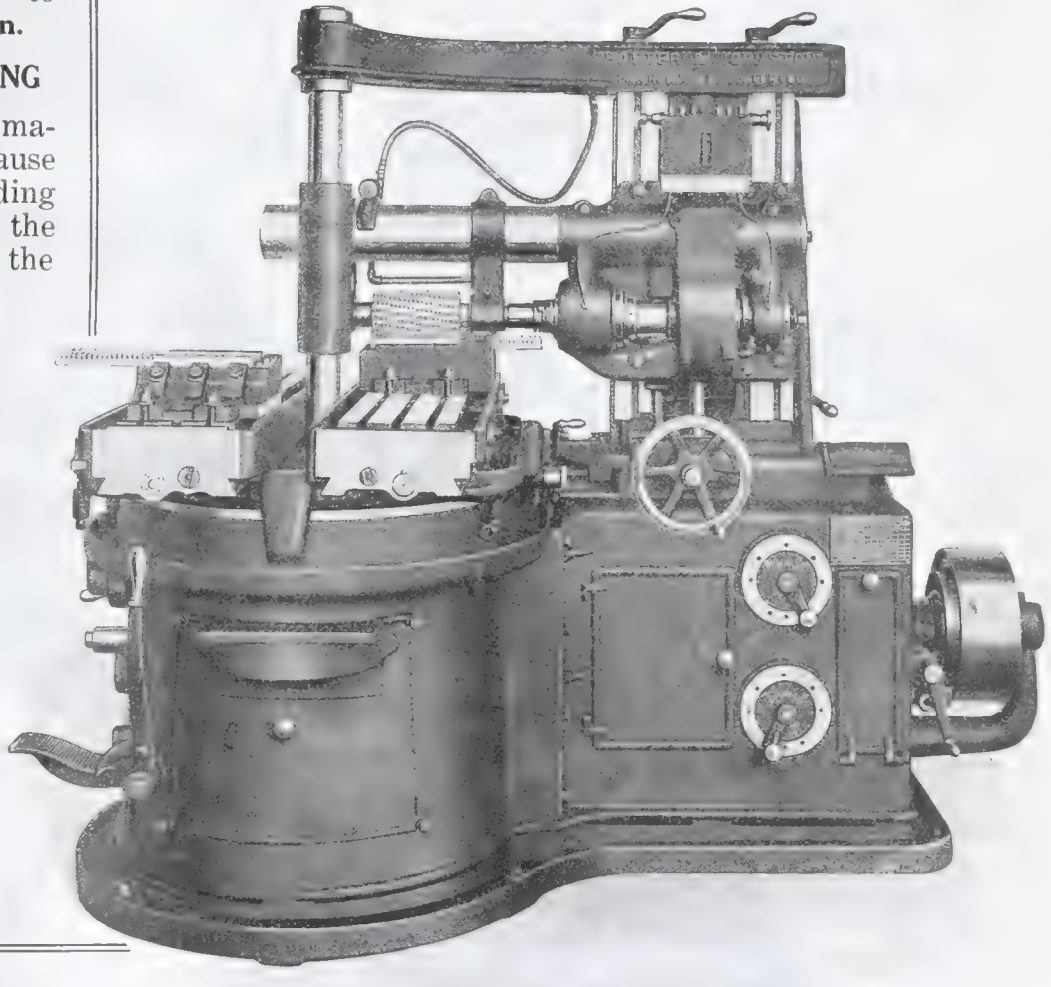
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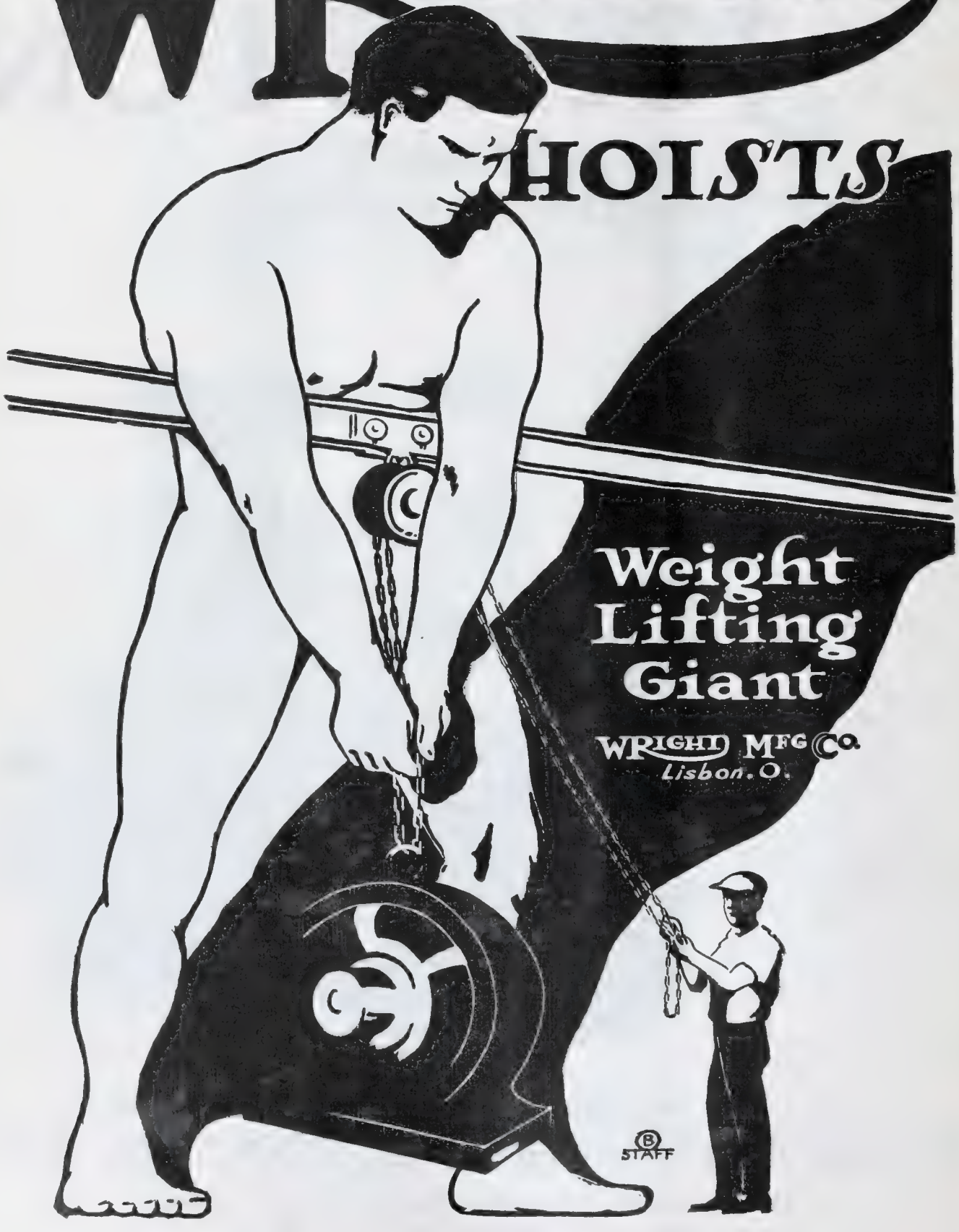
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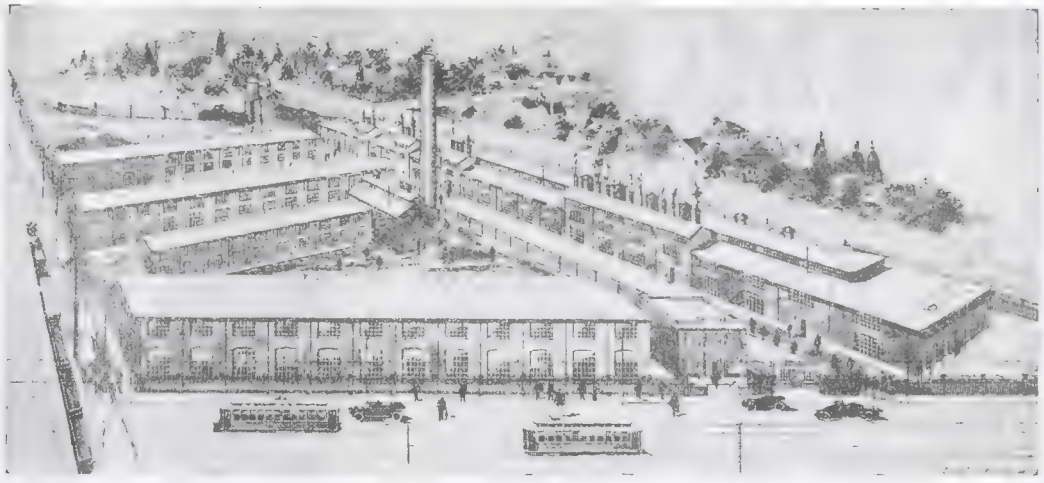


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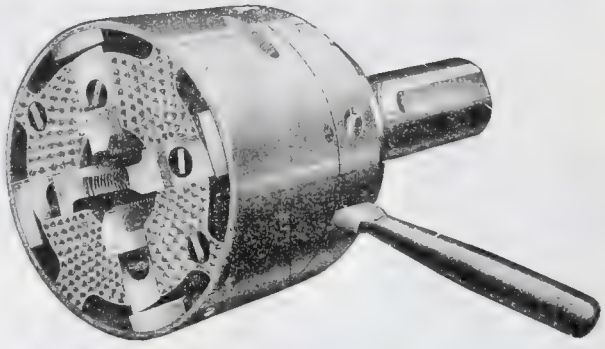
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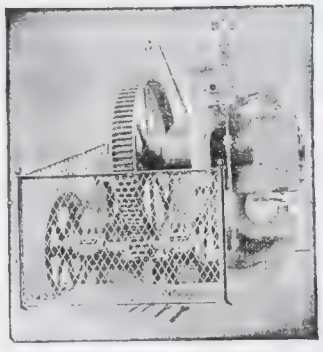
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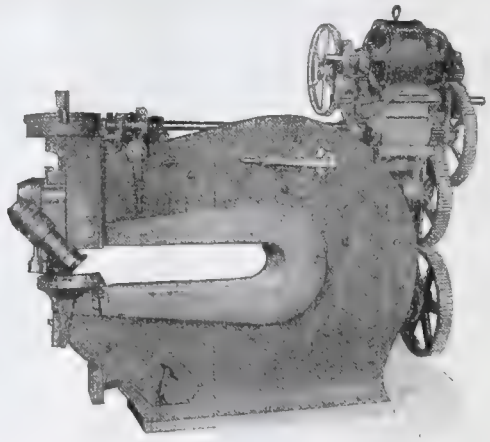
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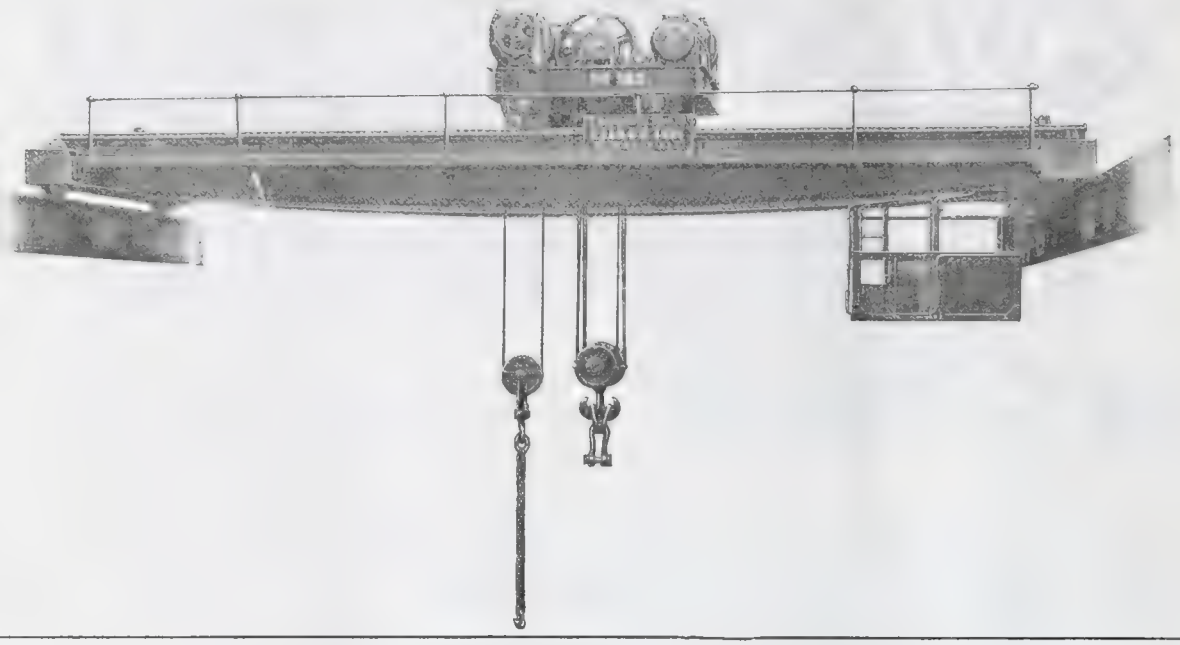
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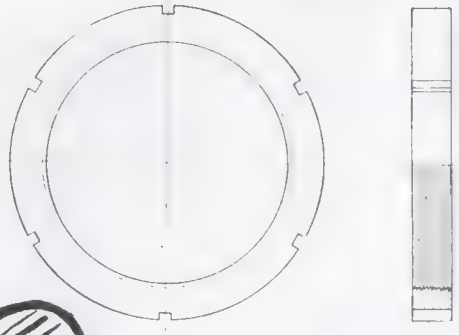
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A Concrete Example



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PIECE MACHINED—Main spindle nut.
THREAD—Diameter, 8″; length, 1¼″; 8 pitch U.S. Standard.
1. Work chucked.
2. Threaded surface milled from rough.
3. One side faced.
4. Put on mandrel. Turn other face and outside.

TIME—Milling operation, 1 min. 45 sec. Milling feed, 14.3″ per min.
MATERIAL—Cast iron.
TOTAL TIME in thread miller, floor to floor, 3¼ min.
NOTE—Smalley-General Thread Miller Method involves no more chuckings than in a lathe and saves much time. Also quality of work better.

Let us tell you more about the "Smalley."

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THE FINANCIAL POST in the House of Commons

IN the House of Commons the other week the attention of the Government was drawn to the article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White, who is familiar with THE FINANCIAL POST, stated his opinion that the reference was to private marketing of bonds.
This is merely a small item from THE POST of recent date, but it goes to show that

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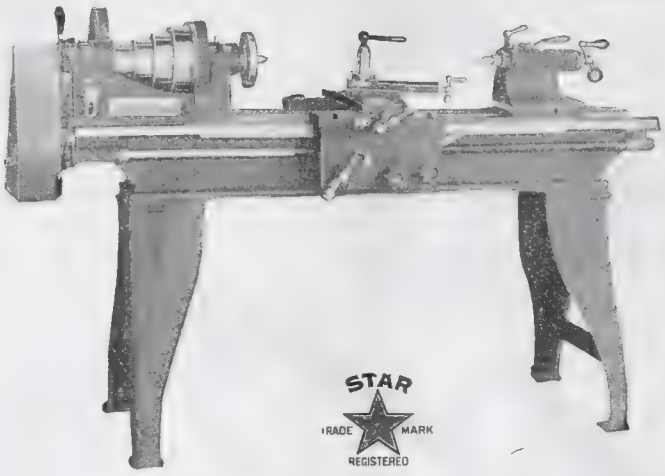
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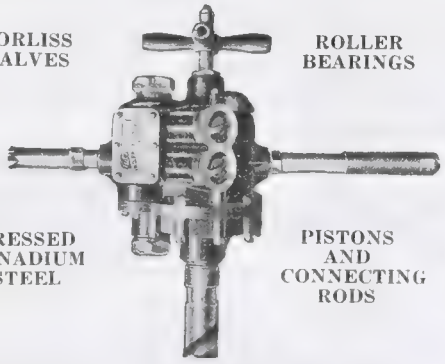


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Four cylinders — two on each side — with Semi-Corliss Valve close to each pair, giving greater power and efficiency.

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ALL RECORDS BROKEN FOR SPEED, POWER and ENDURANCE

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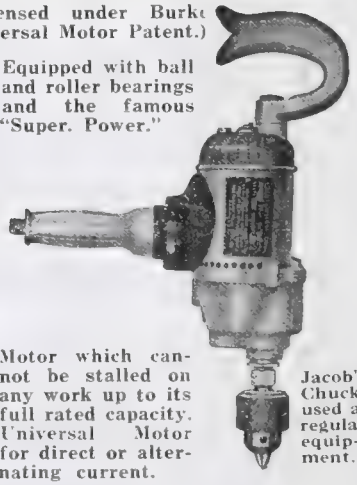


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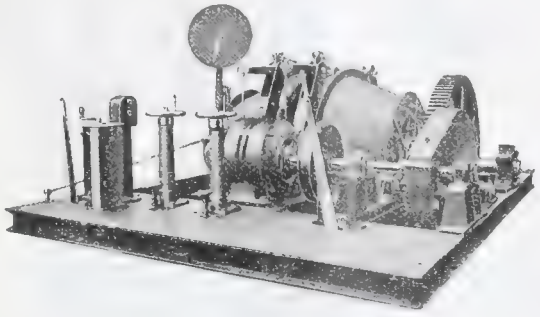
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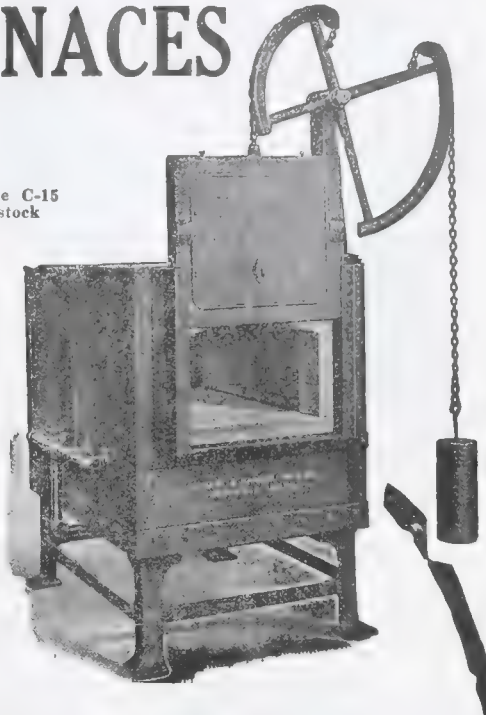
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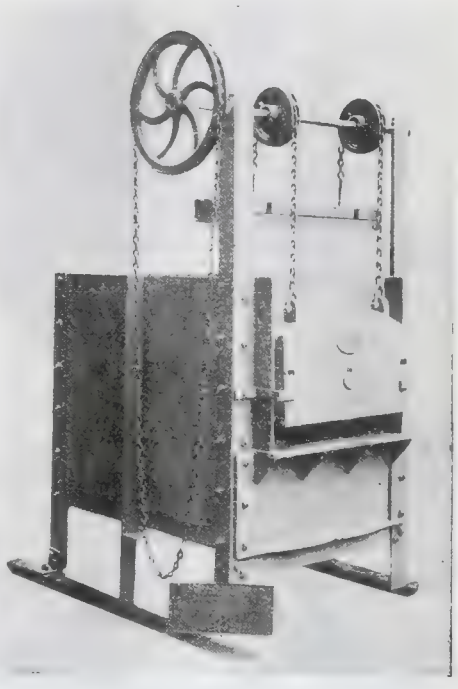
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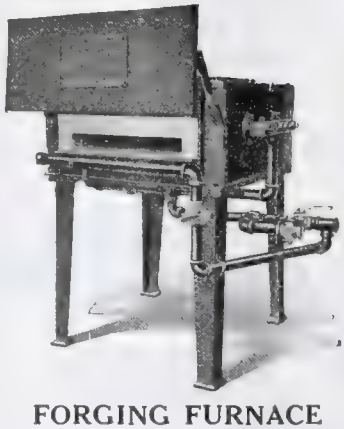
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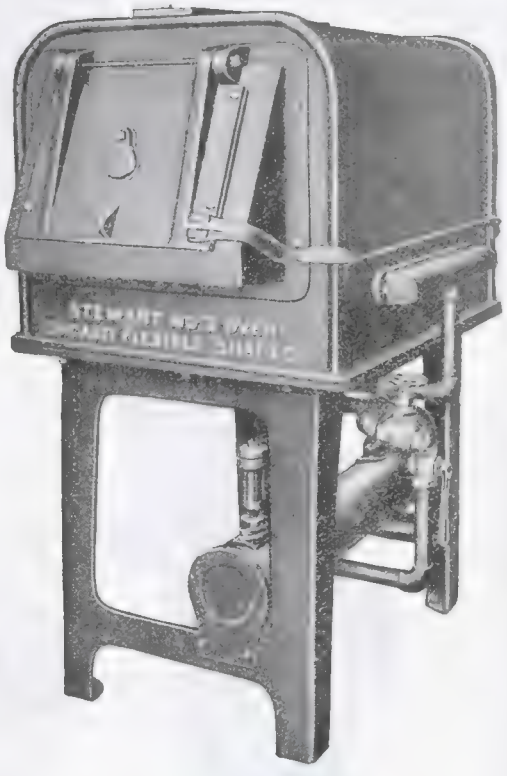
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Send for our catalog and remember that all Stewart Furnaces are sold on 30 days' trial basis at our risk.

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30,000 now in use in 10,000 shops. Over 100 types and sizes to choose from.

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(Ability to see things through)

Applied to Pexto Wrenches it is ability to take hold, hang on, come through and stand ready to do the job over and over again.

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This solid handle Pexto Wrench is made of three strong, simplified parts with heavy wooden riveted handles. The head, bar and handle frame are all forged in one piece from high quality steel, next is the sliding jaw, and third the screw.



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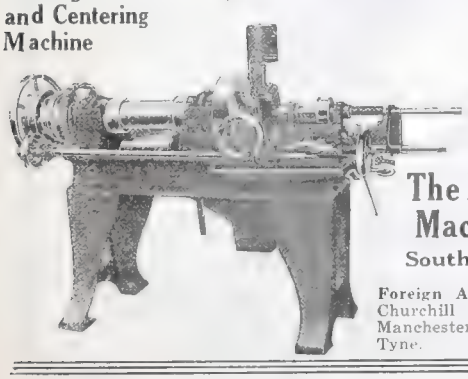
NO matter what your requirements be, we can supply you promptly. If service and quality count with you—we will eventually receive your enquiries.

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HAMILTON, CANADA

One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Hurlbut, Rogers Cutting-off and Centering Machine



Here's Real Economy

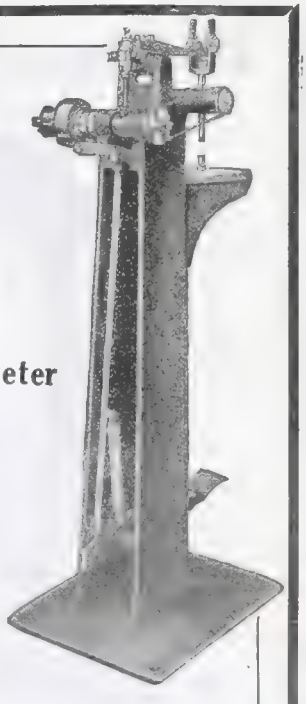
This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools one cutting up and the other cutting down; each holding the work against the other. What is the result? **the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

The Hurlbut, Rogers Machine Company
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A Boy with this GRANT



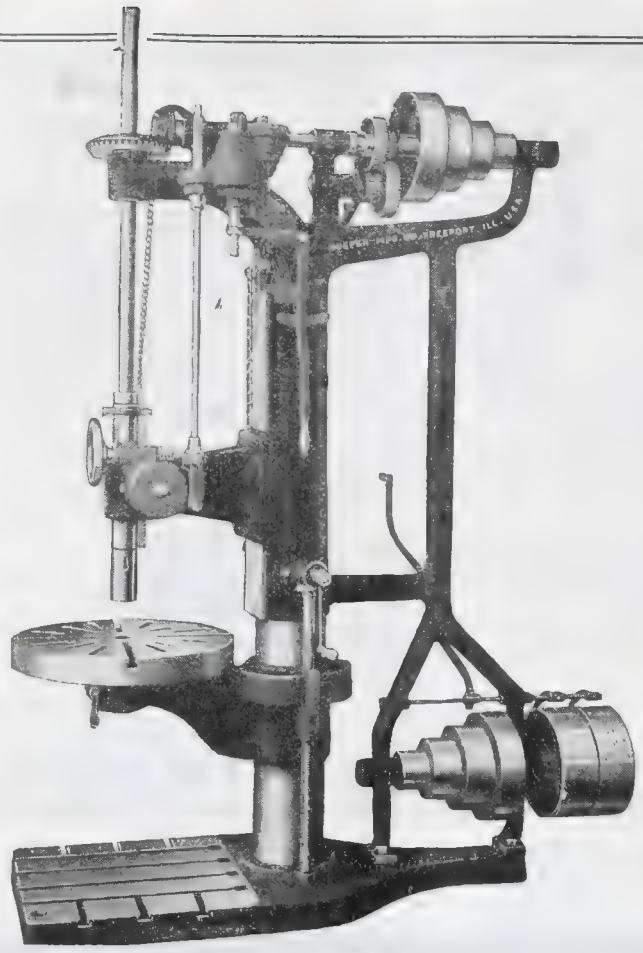
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will do better work and more work than any man with any other riveter.

A dollar-a-day boy will place rivets in small, out-of-the-way corners or close up to the shoulder of the casting that will be as smooth and good looking as any placed in easy-to-reach spots. Can you say that of any other riveter, even with a man operating?

And a boy and a Grant Rotary Riveter are a safe combination. For although the Grant can be operated at a speed limited only by that at which the operator can feed the machine, its friction stopping device enables a boy to regulate its speed at will. **Write us.**

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And know-how is a lot different from know-it-all. The Hoefer engineers are eternally plugging away to make a better driller.

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The BARNES DRILLS

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Complete line. 8-inch to 50-inch swing

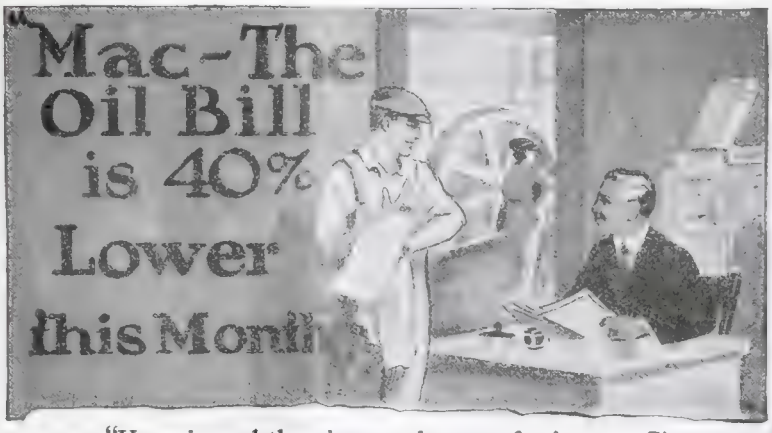
Gang Drills.—Horizontal Drills.

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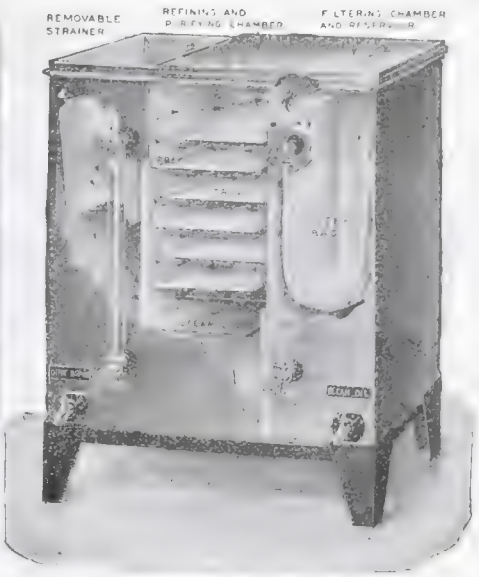
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First, means a cleaner engine room.

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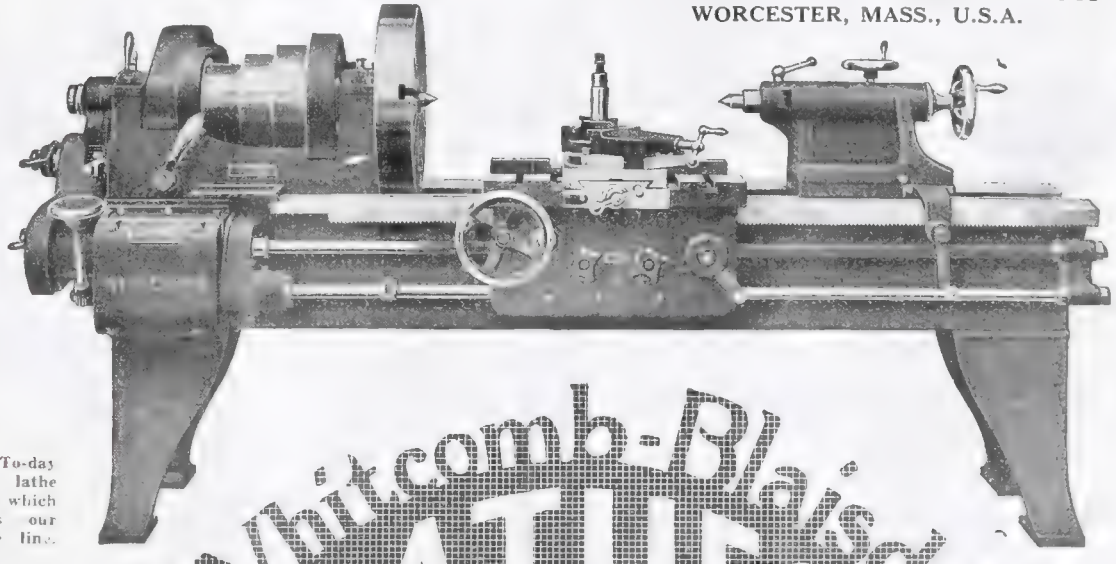
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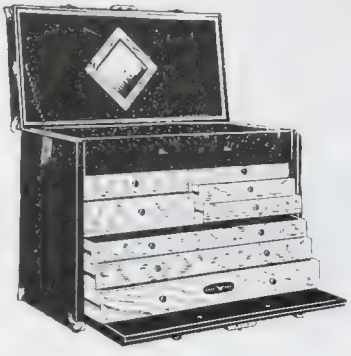
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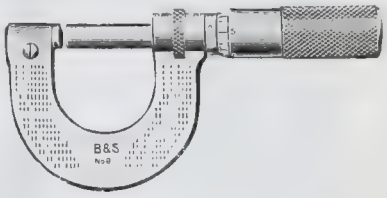
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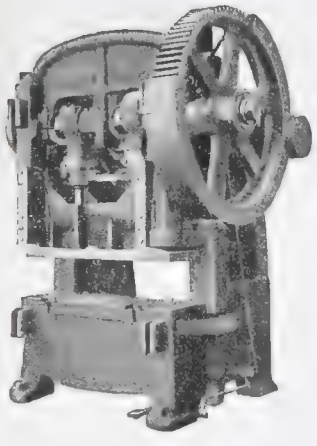
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DOUBLE CRANK PRESSES



Notable for their almost incredible resistance to wear and as economizers of human effort.

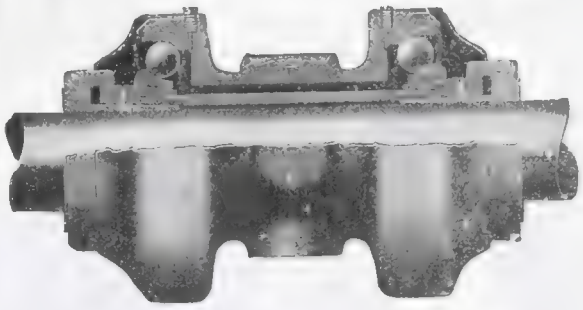
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Chapman Double Ball Bearings are built so as to fit any hanger frame.
They reduce power costs 15% to 40%.
They are entirely drip proof.
They are dust and dirt proof.
Require lubrication once a year.
They increase production.

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The Chapman Double Ball Bearing Co., Limited

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The Transmission Ball Bearing Co., Inc.

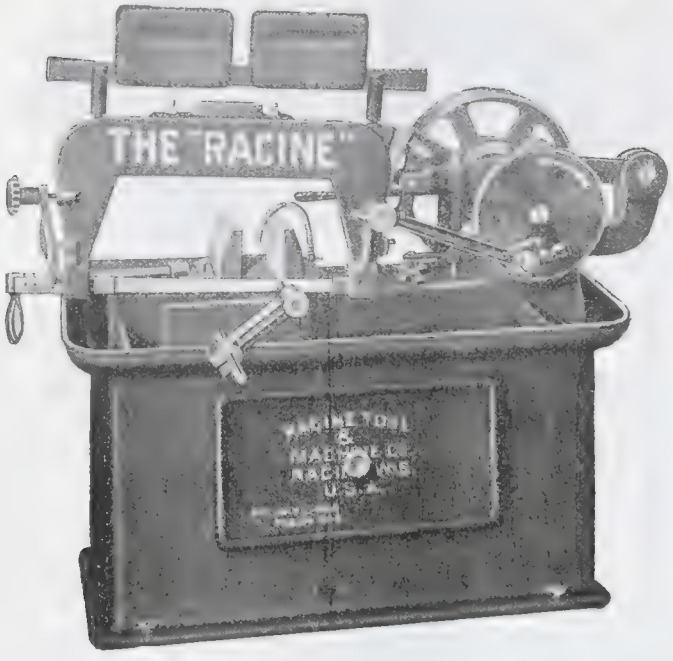
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Use "Racine" H. S. Tungsten Power Blades

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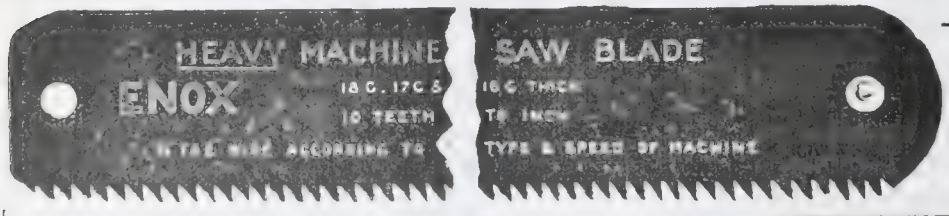
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UNEQUALED IN QUALITY ANY SIZE OR LENGTH

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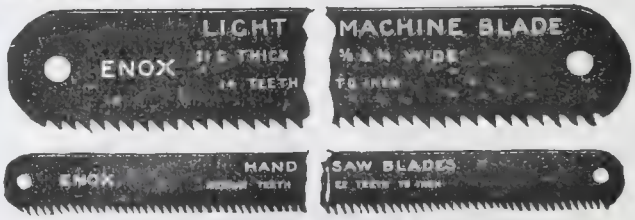
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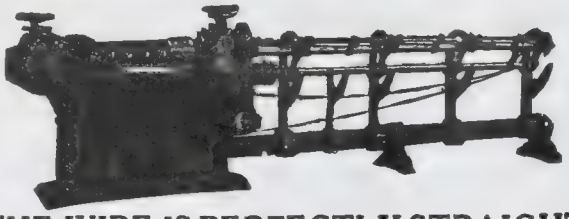


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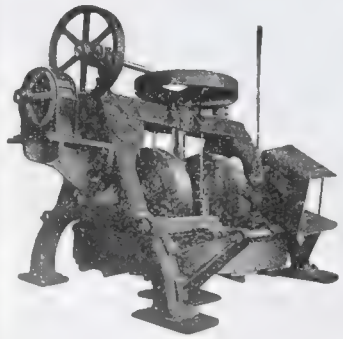
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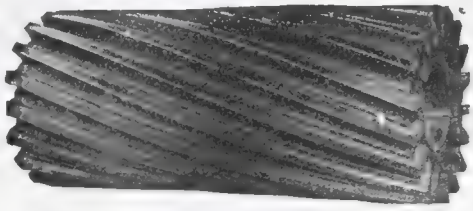
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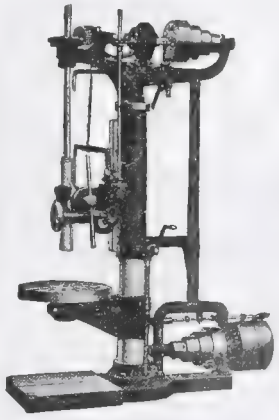
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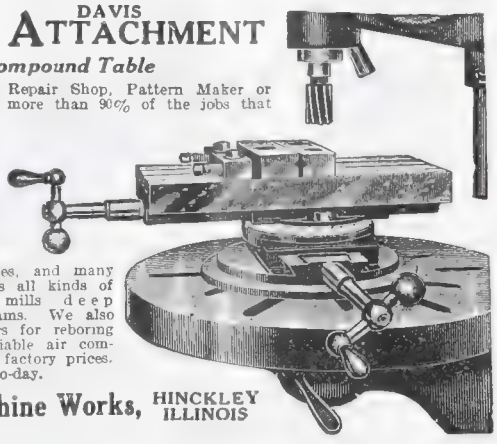
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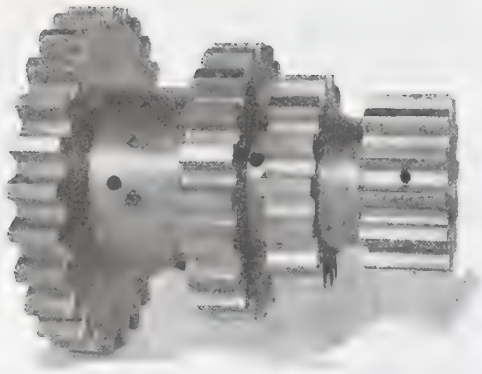


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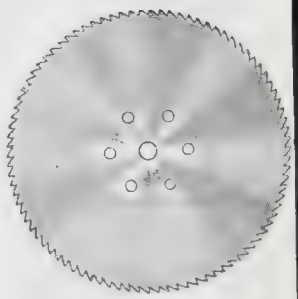
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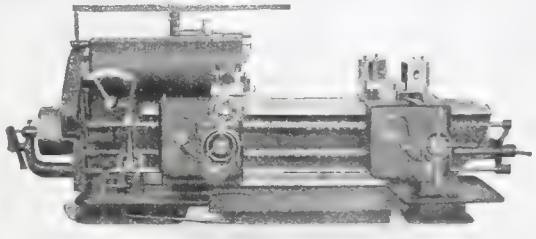


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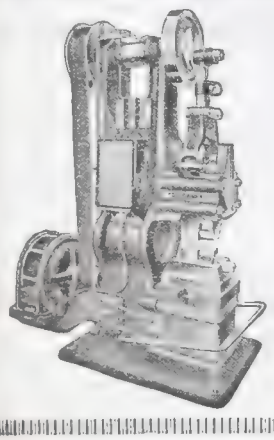
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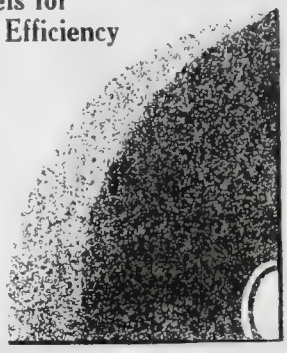
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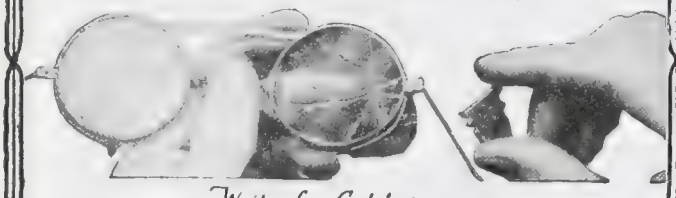
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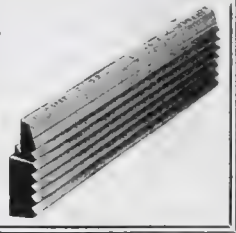
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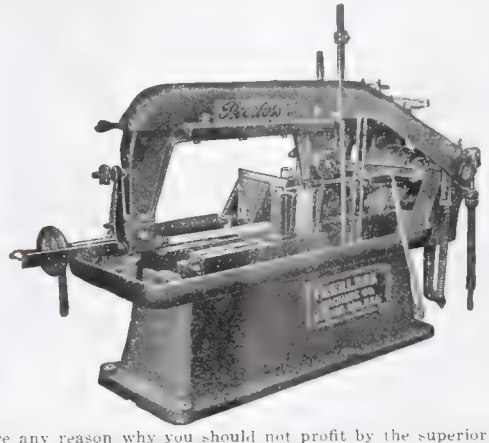
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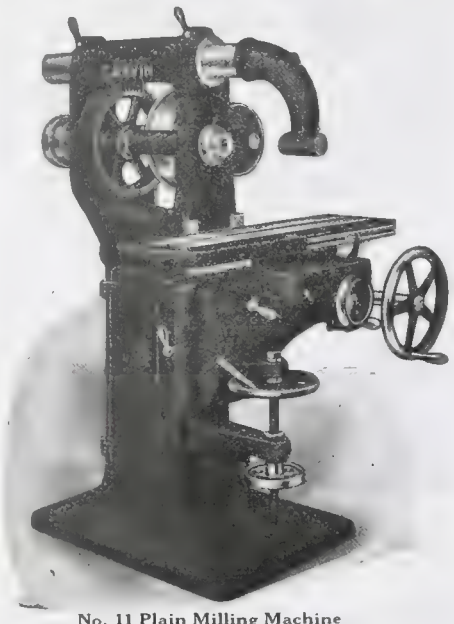
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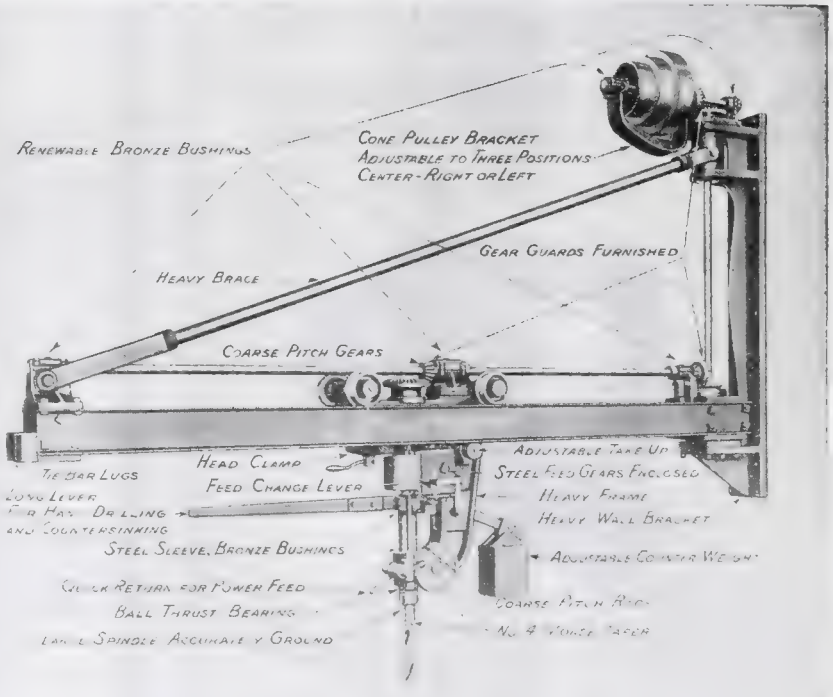
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Wilson & Co., J. C., Belleville, Ont
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal Que

ARCHITECTURAL IRON
Page Steel & Wire Co., Adrian, Mich

ARRESTERS, DUST
Northern Crane Co., Walkerville, Ont.
Sheldons Ltd., Galt, Ont.
Pangborn Corporation, Hagerstown, Md.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que
Welding & Supplies Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
National Acme Co., Cleveland, O., and Windsor
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

AUTOMATIC METAL CUTTING-OFF MACHINES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Canada Metal Co., Toronto.
The Geo F. Foss Mchy. & Supply Co., Montreal.

AUTO SHEET METAL MACHINERY
Quickwork Co., St. Marys, Ohio.

BABBITT METAL
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

BAND SAWS
Oliver Machinery Co., Grand Rapids, Mich

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal.
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company Toronto
The Gray Ball Bearing Co., Ltd., Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Rochester Ball Bearing Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

BALLS, STEEL
The Gray Ball Bearing Co., Ltd., Toronto.
Baker & Co., Inc., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

BALLS BURNISHING
The Gray Ball Bearing Co., Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill
Williams & Wilson, Limited, Montreal, Que

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie, Ont.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie, Ont.

BEADING MACHINES
Quickwork Co., St. Marys, Ohio

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss Mchy & Supply Co., The Geo. F., Montreal
Graton & Knight Mfg. Co., Worcester, Mass
Rice, Lewis & Son, Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids, Mich

BELTING, BALATA
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Ltd., Montreal.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Ltd., Montreal.
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Federal Engineering Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Consolidated Rubber Co., Ltd., Montreal

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.

BELTING, WOVEN
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Ltd., Toronto, Ont.

BENDING ROLLS (PLUTE & AUGH)
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Bertrams, Limited, Edinburgh, Scotland.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto, Ont.
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams & Wilson, Limited, Montreal, Que.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Dennis Wire & Iron Works, London, Ont.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

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The Thos. Pink Co., Ltd., Pembroke, Ont.

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Algoma Steel Corp., Sault Ste. Marie, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
MacGregor & Co., Montreal, Que
Williams & Wilson, Limited, Montreal, Que.

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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont
Welding & Supplies Co., Montreal, Que.

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Mulliner-Edlund Tool Co., Syracuse, N.Y
Wickes Bros., Saginaw, Mich.

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Lufkin Rule Co. of Can., Windsor, Ont.

BOARTZ
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Joyce, Koebel & Co., Inc., New York.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

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MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

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Landis Machine Co., Waynesboro, Pa.
Rice, Lewis & Son, Toronto, Ont
Wells Brothers Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Aikenhead Hardware Co., Toronto, Ont.
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Rice, Lewis & Son, Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead, Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

BOLTS, SPRING SHAKLE
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Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
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National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Oliver Machinery Co., Grand Rapids, Mich.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis
Gisholt Machine Co., Madison, Wis.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
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Gisholt Machine Co., Madison, Wis.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Oliver Machinery Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
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Niles-Bement-Pond Co., New York.
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Williams & Wilson, Ltd., Montreal, Que.

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Manitoba Bridge & Iron Wks., Ltd., Wpg., Can.

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Brown's Copper & Brass Rolling Mills, New Toronto.
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United Brass & Lead Ltd., Toronto.

BRONZE, COPPER
Canada Metal Co., Toronto.

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Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd. ,Walkerville, Ont.

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Bertram & Sons Co., John, Dundas.
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Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Northern Crane Works, Ltd., Walkerville, Ont.

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Parmenter & Bulloch Co., Gananogue, Ont.

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Oberdorfer Brass Co., M. L., Syracuse, N.Y

CALIPERS
Peck, Stow & Wilcox Co., Southington, Conn.

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Pangborn Corporation, Hagerstown, Md.

CALKS, BOOT
Lufkin Rule Co. of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co, Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

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Can. Driver-Harris Co., Ltd., Walkerville, Ont
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor, Ont.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Sheldons, Limited, Galt, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie, Ont.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland, Ont.

CARRIERS
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Greenleafs, Ltd., Belleville, Ont
Oberdorfer Brass Co., M. L., Syracuse, N.Y.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead Ltd., Toronto.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie, Ont.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
International Malleable Iron Co., Guelph, Ont.
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Sheldons, Limited, Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

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Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

CASTINGS, HARDWARE
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CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
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CASTINGS, MALLEABLE
International Malleable Iron Co. Guelph, Ont.

CASTINGS, NICKEL STEEL
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CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son Montreal.

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Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

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Bertram & Sons Co., John, Dundas.
Gardner, Robt., & Son, Montreal.
Hurlburt, Rogers Mach. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., John, Ingersoll Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Morse Chain Co., Ithaca, New York.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Garlock-Walker Machy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Rice Lewis & Son Toronto, Ont.
Williams & Wilson, Limited, Montreal Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE
Morse Chain Co., Ithaca, New York.

CHAINS, BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, DRIVE
Morse Chain Co., Ithaca, New York.

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Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

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Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

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Morse Chain Co., Ithaca, New York.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, New York.

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Coventry Chain Co., Coventry, England.
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Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

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Norton, Ralph B., Agent, Montreal.

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Gardner, Robt., & Son, Montreal.
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Roelofson Machine & Tool Co., Toronto, Ont
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach Co., Brazil, Ind., U.S.A
Williams & Wilson, Limited, Montreal, Que

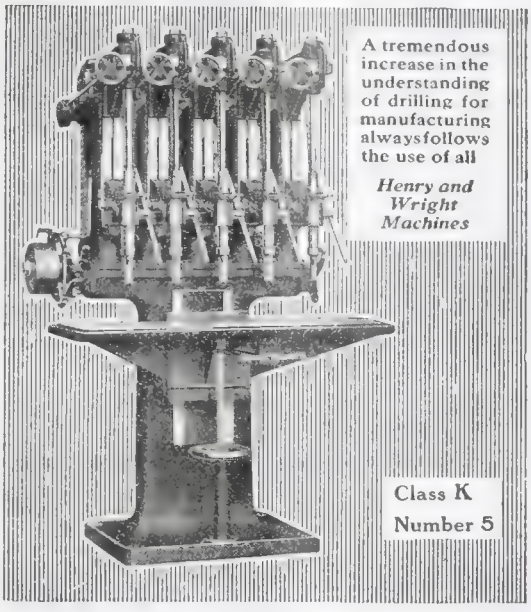
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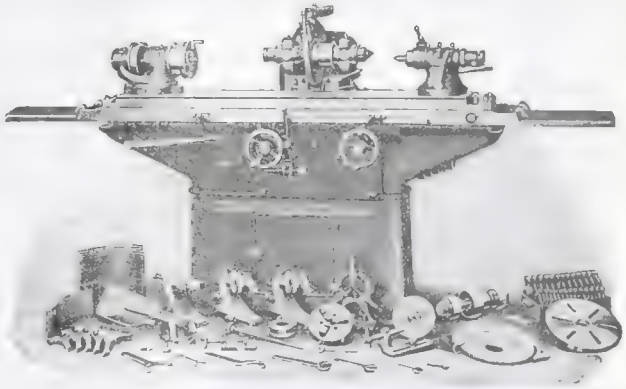


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Northern Crane Works, Ltd., Walkerville, Ont.
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Sheldons, Limited, Galt, Ont.
J. C. Wilson & Co., Belleville, Ont.

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Wilson & Co., J. C., Belleville, Ont.

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United Brass & Lead Ltd., Toronto.

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MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

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Smalley-General Co., Inc., Bay City, Mich.

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Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Welland Motor & Machine Co., Welland, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

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Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
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CONTROLLING INSTRUMENTS
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MacGovern & Co., Montreal, Que.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COOLERS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Garlock Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener, Ont.

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Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.

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Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Limited, Montreal, Que.

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Bernard Industrial Co., The A., Fortierville, Que.
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Williams & Wilson, Limited, Montreal, Que.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
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Independent Pneumatic Tool Co., Chicago, Ill.
Wilson & Co., J. C., Belleville, Ont.

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Northern Crane Works, Walkerville.

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Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Quebec.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice, Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Sheldons, Ltd., Galt, Ont.

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Williams & Wilson, Limited, Montreal, Que.

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Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

CUTTERS, FLUE
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CUTTER HEADS
Oliver Machinery Co., Grand Rapids, Mich.

CUTTERS, PIPE (SEE PIPE CUTTERS)

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Morse Twist Drill & Machine Co., New Bedford.
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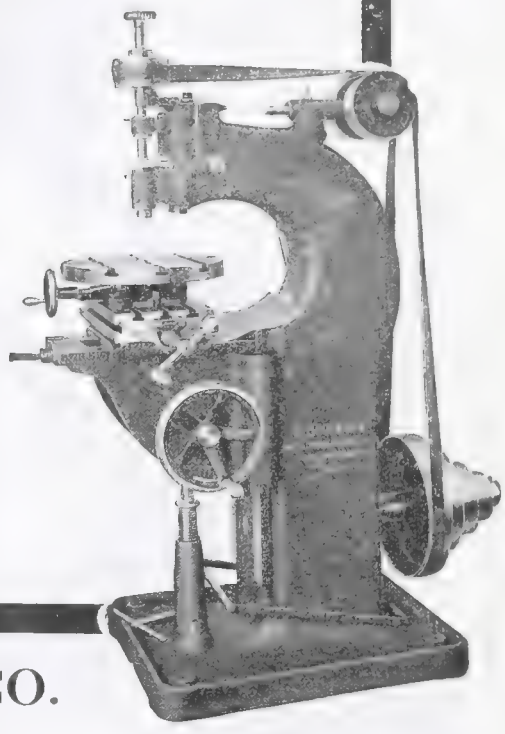
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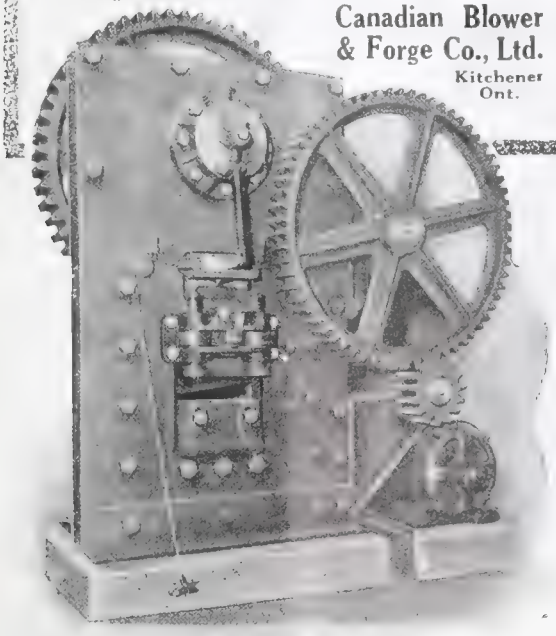
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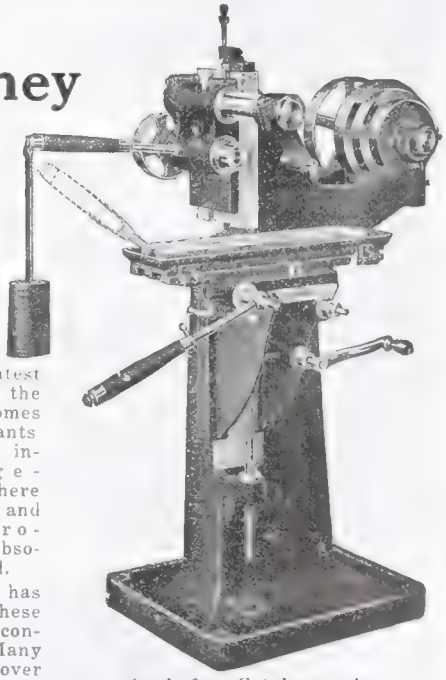
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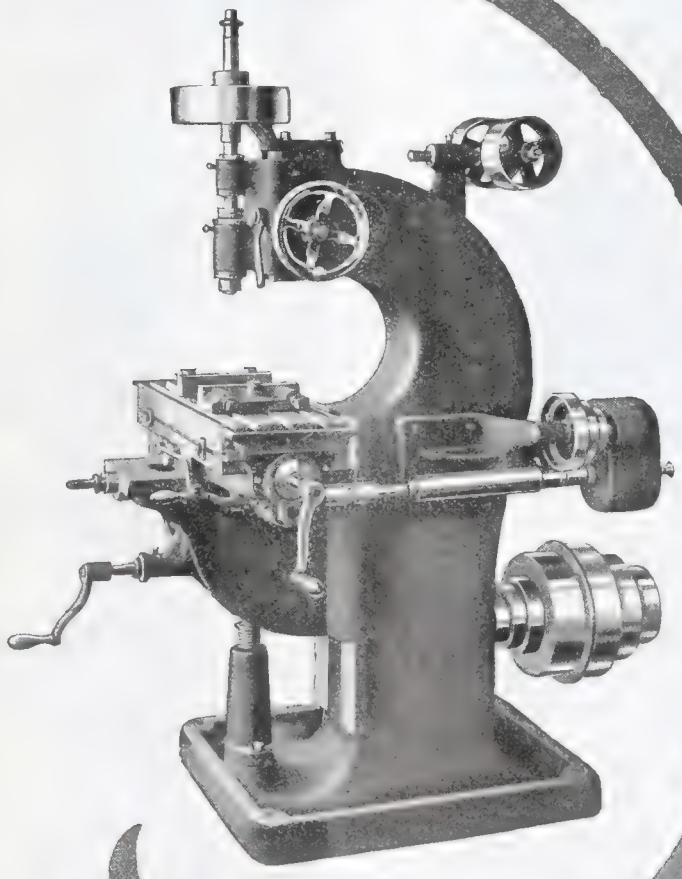
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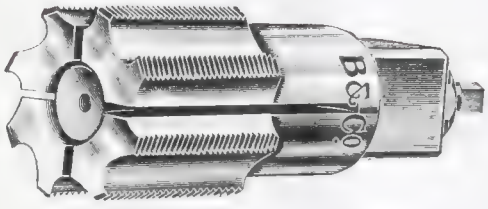
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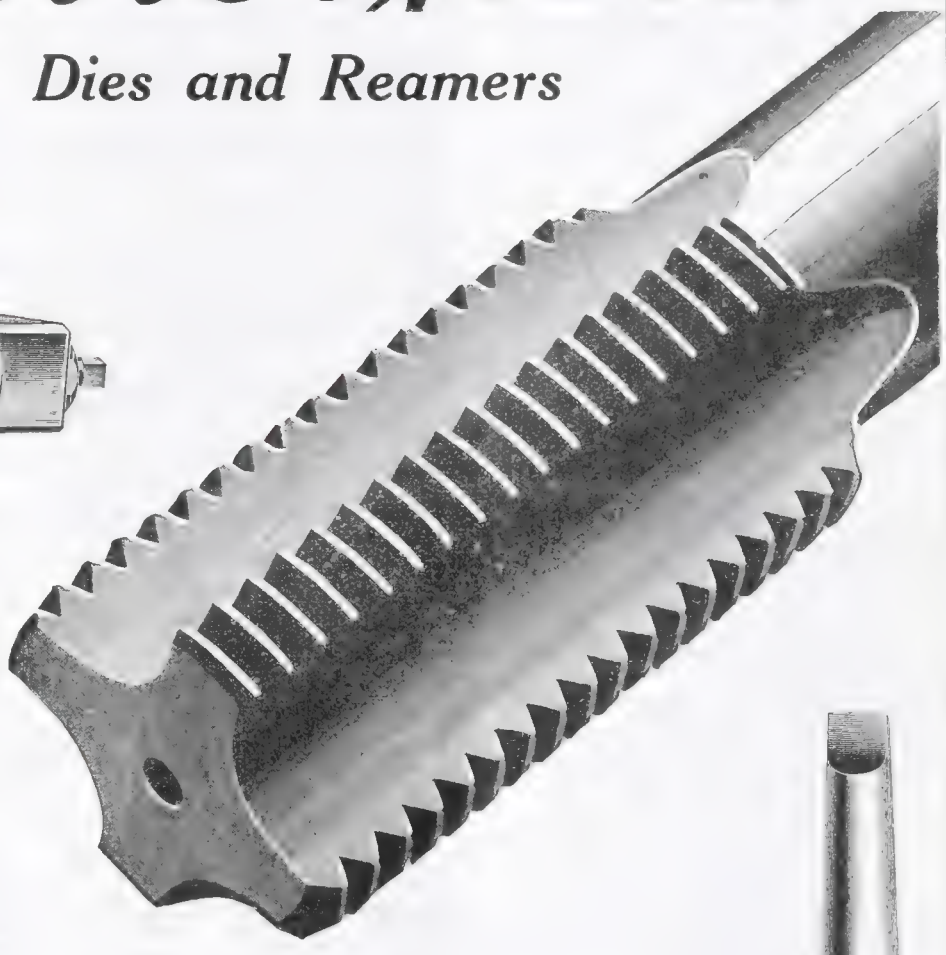
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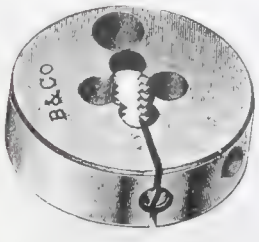
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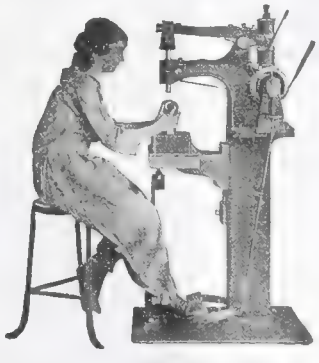
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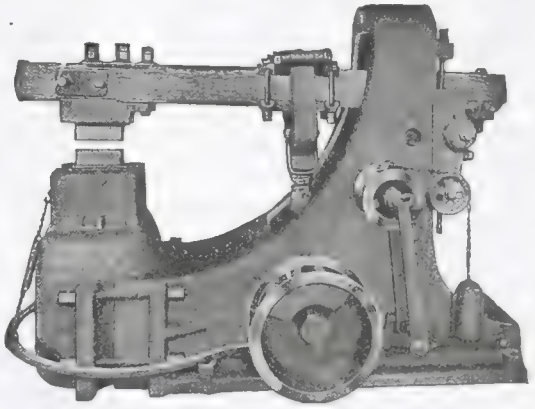
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Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co., Milwaukee, Wis.
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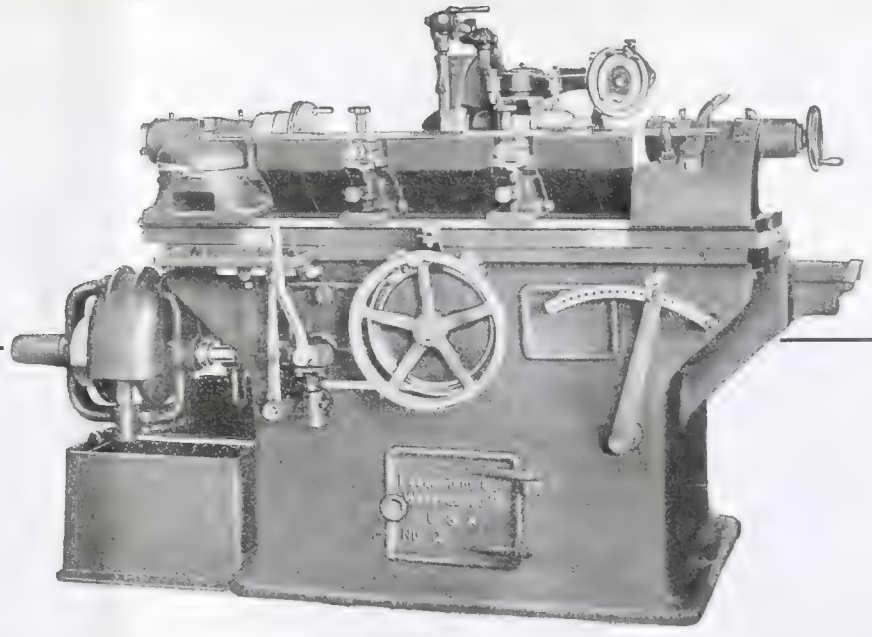
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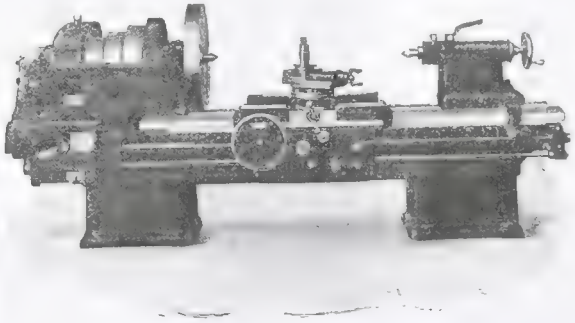
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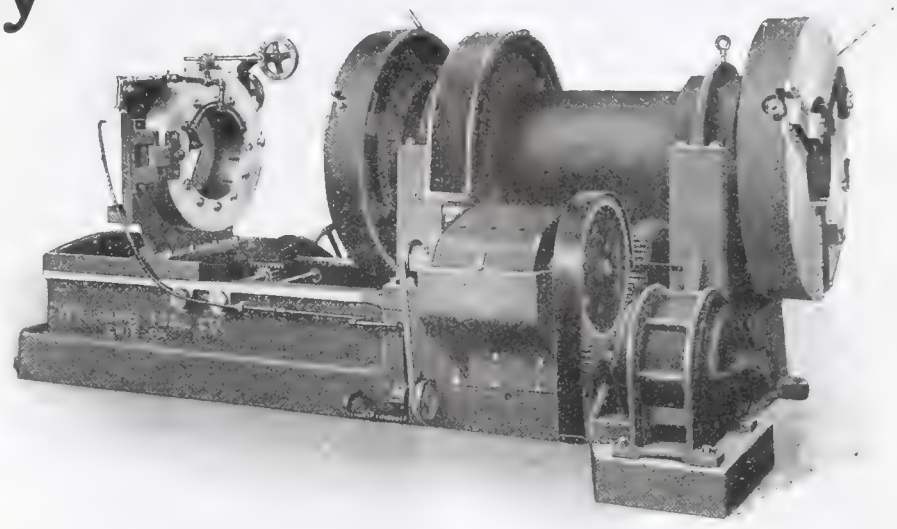
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Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The McCrosky Reamer Co., Meadville, Pa.
The Kelly Reamer Co., Cleveland, O.
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Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Kelly Reamer Co., Cleveland, O.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
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Baxter & Co., Ltd., J. R., Montreal, Que.
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Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, EXPANDING
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield, Mass.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Gisholt Machine Co., Madison, Wis.
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Williams & Wilson, Limited, Montreal, Que

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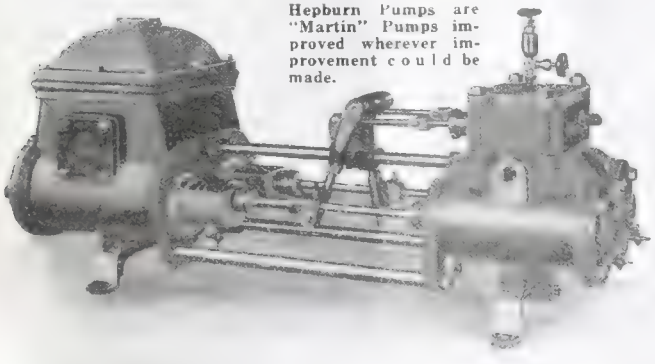
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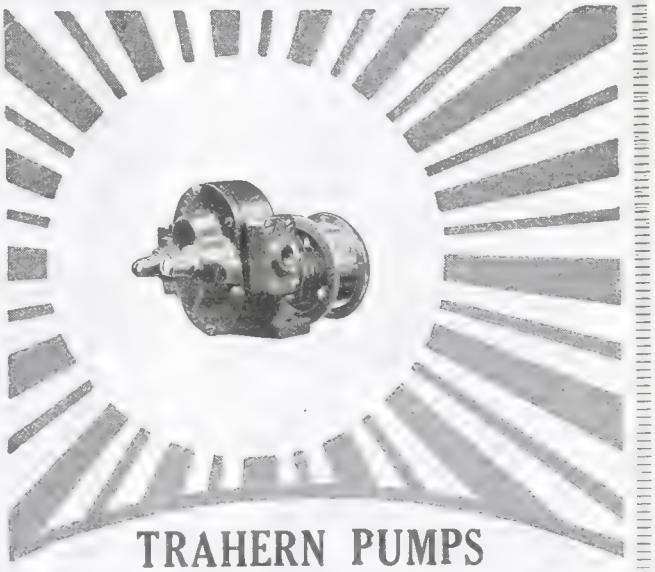
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Morse Twist Drill & Mch. Co., New Bedford, Mass
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Pratt & Whitney Co., Dundas, Ont.
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Norton, Ralph B., Agent, Montreal.

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SHEET METAL STAMPINGS
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Garvin Machine Co., New York.
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WILSON FEARED THE BRITISH

THE American President crossed the Atlantic in the first place with the idea in his mind that his ideals would be thoroughly in accord with those of the French statesmen; but he was rather afraid of a conflict with the British delegates. He found in reality that his plan for peace terms was as far removed from the French plan as the two poles. Then he crossed to London and was surprised to find that the ideas of the two Anglo-Saxon powers were identical.

This situation, according to J. W. Dafoe in the May issue of MACLEAN'S MAGAZINE, explains much that has developed at Versailles. Further, it contains the promise of a close *rapprochement* between the two great English-speaking democracies for all time to come.

Mr. Dafoe has contributed a remarkably interesting article to this number of MACLEAN'S, lifting the curtain on many of the puzzling situations that have arisen overseas. As the editor of the Manitoba *Free Press*, he is the dean of Canadian newspapermen; as the representative of the department of Public Information on the Canadian Mission to the Peace Conference, he was in a special position to learn what was transpiring. He tells of the really big part that Canada has played in the Proceedings and points out that Canada's status as a nation was firmly established in the eyes of the world when she was allowed separate representation.

A Dozen Other Features---Nationally Important

This May issue is full of articles of unusual significance for Canadian readers.

"SOLVING THE PROBLEM OF THE ARCTIC"
—By Vilhjalmur Stefansson

The second instalment of his remarkable story of the four years of exploration that he undertook for the Canadian Government in the region of the "Pole of Inaccessibility"—a harder place to reach than the North Pole.

"ORGANIZING FOR PEACE"
—By George Pearson

An article of the Great War Veterans' Association by a well-known author-soldier.

"THE CANADIANS IN SIBERIA"
—By Capt. W. E. Dunham

A graphic story of what our forces did in combatting the Bolsheviki, by an officer who has just returned.

"SAFE IN THE SADDLE"
—By J. K. Munro

A review of affairs at Ottawa in which the opinion is expressed that Union Government for the time being is safely entrenched.

The National Idea

The articles in this issue of MACLEAN'S reflect the national idea—Canada's part in the Peace Conference, the political situation at Ottawa, the exclusive report of Stefansson's national explorations, the national organization of our returned men, the work of our forces in Siberia. The reader of MACLEAN'S gets a broad idea of what Canada as a whole is doing The value of this issue— and of all issues —is very great, therefore, from an educational standpoint.
MACLEAN'S is the one magazine that should be selected for young Canadians to read.

Four capital stories by famous authors—W. A. Fraser, Lloyd Osborne, Frederic S. Isham and C. W. Stephens.

The Review of Reviews

An unusually fine array of articles is given in this department, selected from the best in magazines and periodicals the world over. Some of the titles are:

Planned to Destroy British Fleet.
How Mackensen Was Caught.
Events of War Foretold by Stars.
What is Life Like Beyond the Grave?
A High-born Bolshevik.
The New Life in Dry America.
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SAW GUARDS
Oliver Machinery Co., Grand Rapids, Mich.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM and STEEL
Dora Forge & Stamping Co. Walkerville, Ont.
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPINGS, METAL

STAMPINGS, METAL AND STEEL
Can. Cartridge Co., Hamilton, Ont.
The Gray Ball Bearing Co., Ltd., Toronto

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Machinery Co., Grand Rapids, Mich.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec

SPEED LATHES
Oliver Machinery Co., Grand Rapids, Mich.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

STEEL BALLS
Rochester Ball Bearing Co., Rochester, N.Y.

STEEL, CRUCIBLE TOOL
Hammond Steel Co., Inc., Syracuse, N.Y.
Illingworth Steel Co., John, New York, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

SURFACES
Oliver Machinery Co., Grand Rapids, Mich.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Canada, Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL CASTINGS
Joliette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Electric Steel & Metals Co., Welland, Ont.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.
Swedish Crucible Steel Co., Windsor, Ont.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal
Union Drawn Steel Co., Hamilton, Ont.

STEEL, PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

STEEL, NICKEL
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., John, New York, N.Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co. Montreal, Que.

STEEL, GRIT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL, CHROME AND MANGANESE
Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York, N.Y.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh, Pa

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

STEEL, SPECIAL ELECTRIC ALLOY
Hammond Steel Co., Inc., Syracuse, N.Y.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie, Ont.

STEEL, VANADIUM
Armstrong, Whitworth of Canada, Montreal, Que.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STOCK RACKS FOR BARS, PIPING, ETC.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Limited, Hespeler, Ont
Rice, Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

STRAIGHTENING MACHINER
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Page Steel & Wire Co., Adrian, Mich.

SYSTEMS, REMOTE CONTROL FOR OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

STORAGE AND HANDLING SYSTEMS FOR DRY CLEANERS, AND NAPHTHA
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

SYSTEMS, RECLAIMING, FOR OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind

SYSTEMS, RAILWAY OIL, STORAGE AND HANDLING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

SYSTEMS, PAINT, OIL STORAGE AND HANDLING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

SYSTEMS, OIL STORAGE AND DISTRIBUTING
Bowser & Co., S. F., Inc., Fort Wayne, Ind

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto

TANKS, GASOLINE, KEROSENE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Dominion Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, LUBRICATING OIL, STORAGE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

TANKS, RUBBER CEMENT
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
MacGregor & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANKS, UNDERGROUND STORAGE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

TANK WAGONS
Canadian Welding Works, Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANKS, WHEEL, FOR LUBRICATING OIL AND GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice, Lewis & Son, Toronto, Ont.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal, Que.

TAPES—MEASURING, STEEL AND WOVEN
Lufkin Rule Co. of Can., Windsor, Ont.

TAPES, POCKET
Lufkin Rule Co. of Can., Windsor, Ont.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Victor Tool Co., Waynesboro, Pa.

TAPS, BOILER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, GUN
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, HAND
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, STAYBOLT, "MAX" TAP
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, TAPPER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
L. S. Starrett Co., Athol, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

TAP EXTRACTORS
Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, ENGRAVED
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, TEMPERATURE AND PRESSURE
Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX
Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City

TENOVERS
Oliver Machinery Co., Grand Rapids, Mich.

TESTING LABORATORIES
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

THREADING TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

THREAD MILLING MACHINES
Taft-Pierce Mfg. Co., New York, N.Y.
The Gray Ball Bearing Co., Ltd., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

THUMB SCREWS AND NUTS
Canada Found'ls & Forgings Ltd., Welland, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
United Brass & Lead Ltd., Toronto
Williams & Co., J. H., Brooklyn, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Williams & Wilson, Limited, Montreal, Que.

TIRE BENDERS
A. B. Jardine & Co., Limited, Hespeler, Ont.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice, Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Alkenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland
Armstrong Bros. Tool Co., Chicago.
Deloro Smelting & Refining Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
General Steel Co., Milwaukee, Wis.
H. A. Drury Co., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hammond Steel Co., Inc., Syracuse, N.Y.
Harvey & Co., Arthur C., Boston, Mass.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Rice, Lewis & Son, Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, BENDING
Peck, Stow & Wilcox Co., Southington, Conn

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Limited, Hespeler, Ont.
Rice, Lewis & Son, Toronto, Ont.

TOOLS, ADJUSTABLE BORING
The Kelly Reamer Co., Cleveland, O.
Williams & Wilson, Limited, Montreal, Que

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill
A. R. Williams Machinery Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

TRACK, PORTABLE STEEL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

TRACK SYSTEMS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRANSFORMERS
MacGovern & Co., Montreal, Que.

TRANSMISSION CHAIN
Morse Chain Co., Ithaca, New York

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Coventry Chain Co., Coventry, England.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke, Que.
Wilson & Co., J. C., Belleville, Ont.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Dominion Bridge Co., Montreal, Quebec.
MacKinnon Steel Co., Sherbrooke, Quebec.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRANSVEYORS
Cowan Truck Co., Holyoke, Mass.

TROLLEYS
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Cowan Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Quebec.
Rice, Lewis & Son, Toronto, Ont.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.
Tallman Brass and Metal Co., Hamilton, Ont.

TUBING COILERS, FLEXIBLE METAL
Almond Mfg. Co., T. R., Ashburnham, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.

TURRET MACHINES, LATHES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich
Pratt & Whitney, Hartford, Conn.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURBINES, HORIZONTAL
Wilson & Co., J. C., Belleville, Ont.

TURBO GENERATOR UNITS
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURNBUCKLES
Canada Foundries & Forgings Ltd., Welland Ont
Morrow Screw & Nut Co., John, Ingersoll Ont
Rice, Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
A. R. Williams Machy. Co., Toronto
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VANADIUM STEEL
J. F. A. Comstedt, New York City, N.Y.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
A. R. Williams Machy. Co., Toronto
Williams & Wilson, Limited, Montreal, Que.

VISE STANDS, PORTABLE
Williams & Co., J. H., Brooklyn, N.Y.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Williams & Wilson, Limited, Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn
Williams & Wilson, Limited, Montreal, Que.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester, Mass
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Toronto Iron Works, Ltd., Toronto.

WELDING, ELECTRIC, SPOT, BUTT, ETC
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING GOGGLES
Strong, Kennard & Nutt Co., Cleveland, Ohio

WELDING RODS AND WIRE
Page Steel & Wire Co., Adrian, Mich
Welding & Supplies Co., Montreal, Que.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Anderson & Co., of Canada, Geo., Montreal, Que
Wheel Trueing Tool Co., Windsor, Ont
Williams & Wilson, Limited, Montreal, Que.

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que.
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

WIRE, CAST STEEL AND MUSIC
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRING MACHINES
Quickwork Co., St. Marys, Ohio.

WRENCHES, PIPE, POWER
Peck, Stow & Wilcox Co., Southington, Conn.

WROUGHT IRON PIPE BENDS
James Ballantyne, Montreal.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.
Page Steel & Wire Co., New York, N.Y.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada
F. B. Shuster Co., New Haven, Conn

WIRE NAILS
Page Steel & Wire Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Page Steel & Wire Co., New York, N.Y

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver Harris Co., Ltd., Walkerville, Ont

WIRE SPRING
Page Steel & Wire Co., Adrian, Mich.

WIRE STEEL, BRASS, COPPER,
Page Steel & Wire Co., New York.
Steel Co. of Canada, Ltd., Hamilton, Ont

WIRE, WEAVING, MONEL METAL, BRASS COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Canadian Driver Harris Co., Limited, Walkerville, Ont.

WIRE, MUSIC
Boker & Co., Inc., H., Montreal, Que

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

WOOD TRIMMERS
Oliver Machinery Co., Grand Rapids, Mich.

WOOD LATHES
Oliver Machinery Co., Grand Rapids, Mich

WOOD MILLING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

WOOD SHAPERS
Oliver Machinery Co., Grand Rapids, Mich

WRENCHES
Williams & Co., J. H., Brooklyn, N.Y.
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canada Foundries & Forgings, Ltd., Welland Ont
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines Ont

WOVEN STEEL PARTITIONS
Page Steel & Wire Co., Adrian, Mich

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield Mass
Whitman & Barnes Mfg. Co., St. Catharines Ont

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont
Bemis & Call Hdwe. & Tool Co., Springfield, Mass
Peck, Stow & Wilcox Co., Southington, Conn
Rice Lewis & Son, Toronto, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines Ont
Williams & Co., J. H., Brooklyn, N.Y.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass
Keystone Mfg. Co., Buffalo, N.Y.
Williams & Wilson, Limited, Montreal, Que.

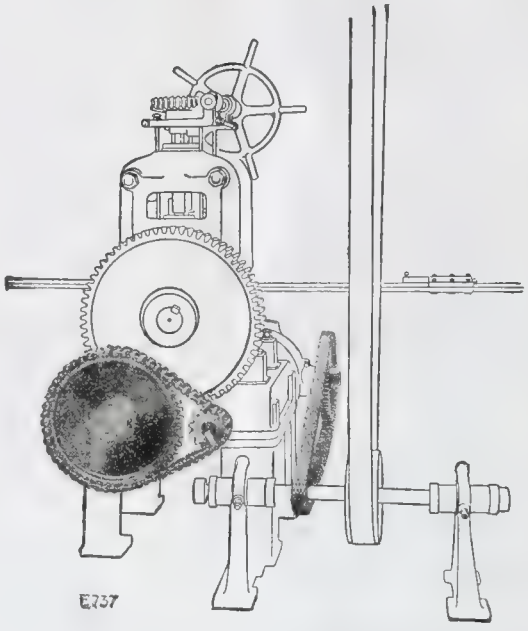
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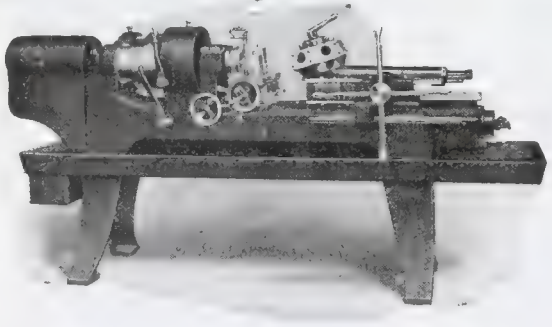
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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XXI. TORONTO, MAY 15, 1919 No. 20

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Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A. R. KENNEDY, Managing Editor. B. G. NEWTON, Manager.

Associate Editors: J. H. RODGERS. W. F. SUTHERLAND, T. H. FENNER.

Eastern Canada Representative: F. L. Jennings; Ontario Representative: S. S. Moore; Toronto and Hamilton Representative; W. E. G. MacDonald.

CHIEF OFFICES:

CANADA—Montreal, Southam Building, 128 Bleury Street, Telephone 1004; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 1207 Union Trust Building, Telephone Main 3449.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable address: Atabek, London, England.

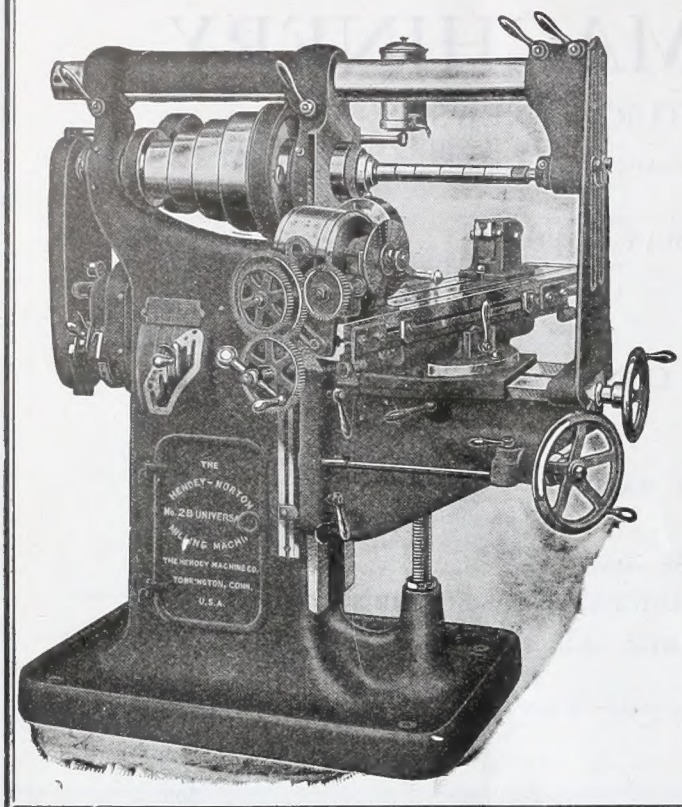
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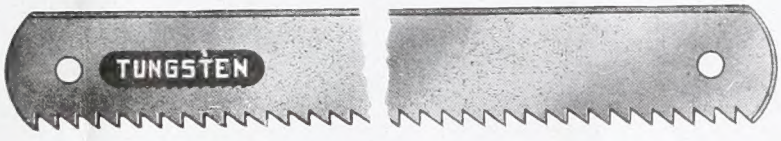
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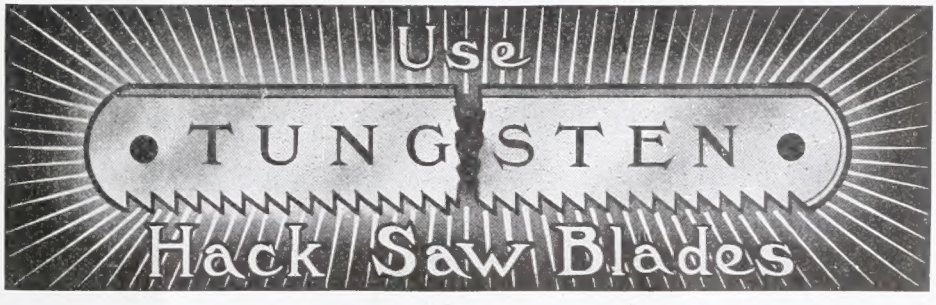


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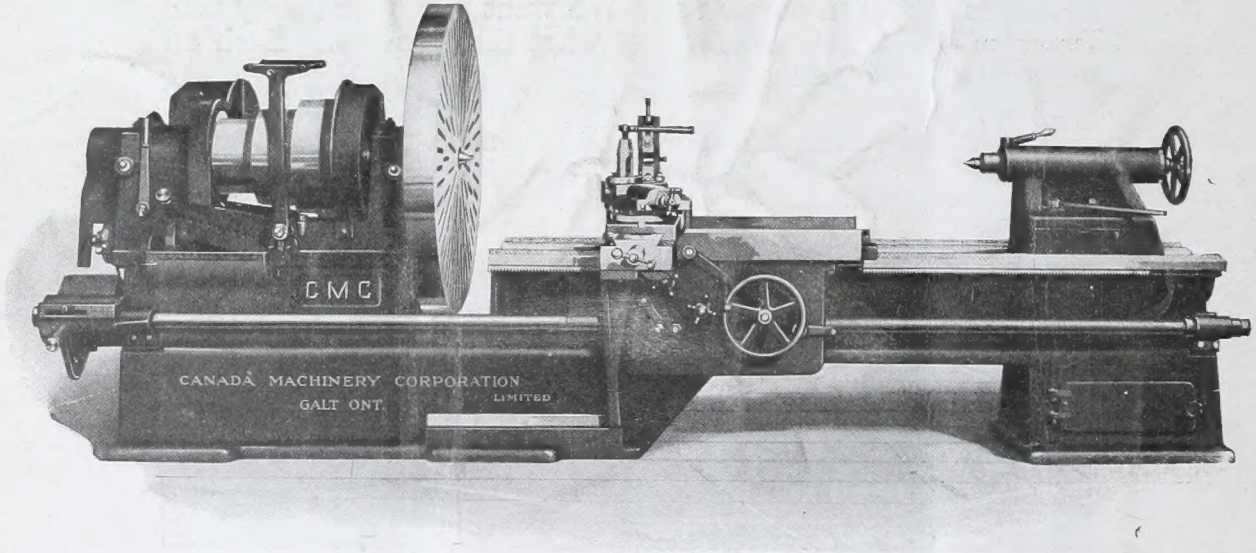
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